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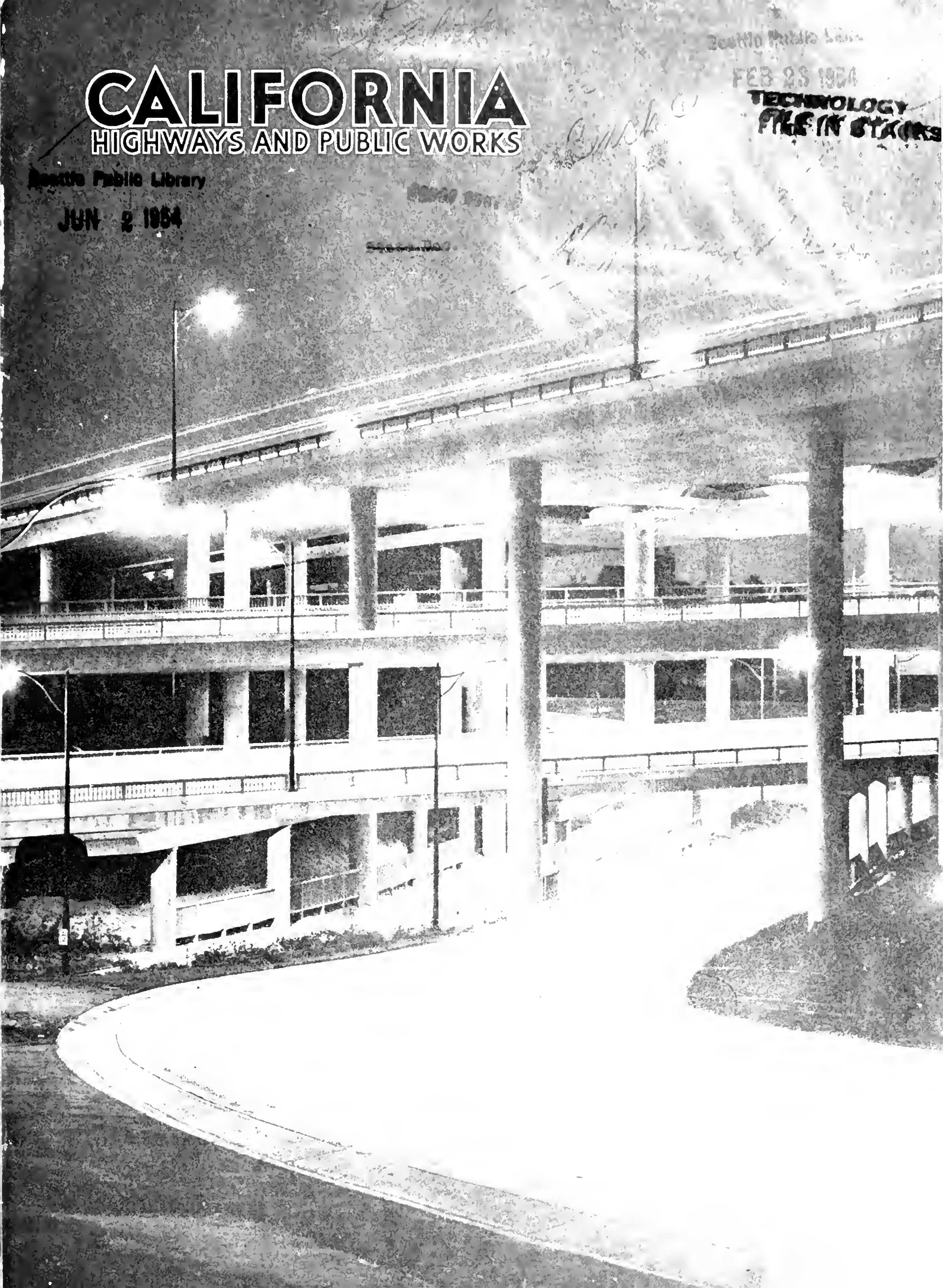
CALIFORNIA
HIGHWAYS AND PUBLIC WORKS



California Highways and Public Works

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CONTENT

Southern Freeways

Progress Report on Los Angeles Highways

By PAUL O. HARDING
Assistant State Highway Engineer

)HORTLY AFTER the termination of Vorld War II the California State .egislature under the Collier-Burns Iighway Act provided financing perlitting a serious start on the correcion of the accumulated deficiencies pon the California State Highway ystem. One of the most important hases of this effort involved the contruction of metropolitan freeways, rior progress on which in District /II including Los Angeles, Ventura nd Orange Counties, has been reorted from time to time. The last ession of the Legislature provided urther funds to accelerate this program of work, the results of which in xpediting progress after such a short apse of time may not be readily apparent to many citizens of the State. These added funds, however, are having a definite effect upon the progress of the freeway program, the impact of which will be gradual but positive.

ADVANCED RIGHTS OF WAY

The 1952 Session of the Legislature for the first time provided funds earmarked for advance acquisition of rights of way on freeway routes in the path of imminent residential, commercial or industrial property development. The last session of the Legslature increased these funds and converted them into a revolving fund reimbursible from regular highway users funds at such time as future construction upon such freeways is possible. Here again progress on this phase of endeavor may not be immediately apparent but the benefits both in the saving of many millions of dollars of future funds and in the expediting of the over-all metropolitan freeway program is all on the positive side of the ledger.

At the end of the war and for many years prior thereto, the state gasoline tax was 3 cents per gallon, of which 1¾ cents was available for state highways. The Collier-Burns Highway Act of 1947 increased the gas tax to 4½ cents per gallon and supplemented this by other motor vehicle fees, which, however, were more than offset by a 2-cent-per-gallon allocation to cities and counties for roads and streets off the highway system. The 1953 Legislature increased the state gasoline tax to 6 cents per gallon, also increasing supplemental taxes in proportion, but made this increase effective for only two years, after which both the gas tax and supplemental fees are to be decreased to the 5½-cent equivalent. The 1952 Legislature had provided $10,000,000 for advance rights of way, which was converted into a revolving fund and increased to $30,000,000 at the 1953 Session of the Legislature.

PAUL O. HARDING

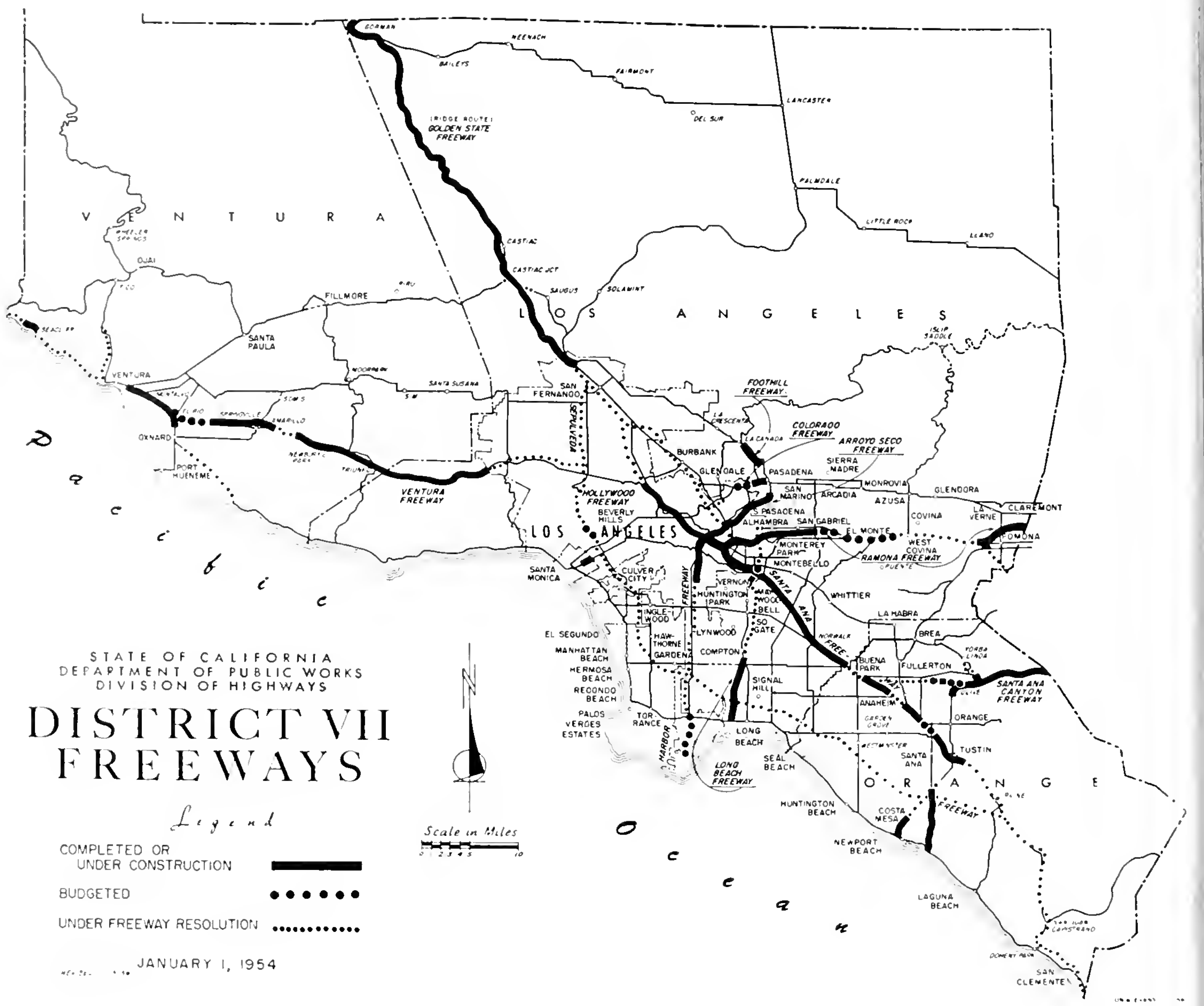
LOS ANGELES AREA

In the metropolitan Los Angeles area those freeways of the system providing the greatest traffic service are, naturally, those which lie through the most densely settled areas where the right-of-way problem is extremely acute and may entail 60 percent or more of the total cost of the project. Planning for such freeways must be on the basis of providing sufficient right-of-way funds to permit construction for traffic relief at the earliest possible date. The immediate effect, therefore, of the additional funds allocated to this important metropolitan area in the 1953-54 Fiscal Year was an allocation of some 56 percent of the total District VII budget for rights of way involving the acquisition of an estimated 3,600 parcels. Work on this acquisition, upon which construction will largely follow in the 1954-55 Fiscal Year, has been progressing most satisfactorily.

Our policy has always been to clear acquired right of way immediately ahead of construction, so that work upon this heavy right-of-way program is not readily apparent to the public. Next year much more tangible evidence will be presented in the form of construction accomplishment. Previous right-of-way acquisition, however, permitted some acceleration of construction in the present year, although most projects now being completed and opened for travel are largely the result of the original Collier-Burns financing.

FULL FREEWAYS

Within the Los Angeles metropolitan area the freeways are being developed on a full freeway basis with all conflict of cross traffic eliminated by grade separation bridges, and all in-



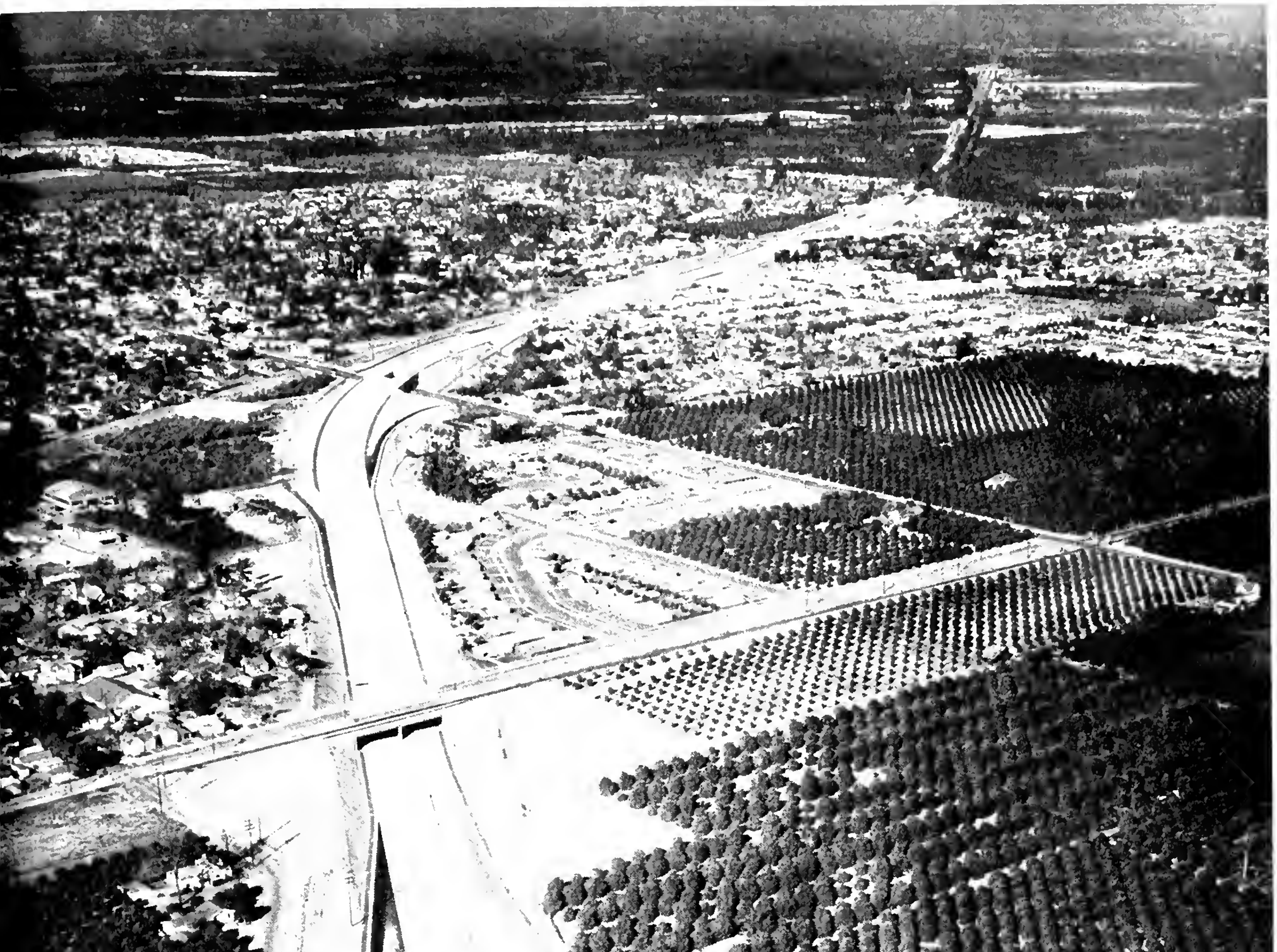
gress and egress rights of abutting properties along the freeway completely eliminated. Other District VII freeways in outlying rural or semi-rural areas are, technically speaking, expressways. The rights of way are obtained largely on a freeway basis. The access is definitely controlled. The first construction is on a stage basis as a four-lane divided highway with channelized and signalized intersections at grade provided for cross-traffic arterials. The plan is that at some later date when funds are available and traffic demands so warrant that grade separation bridges will be built in place of the highway intersections at grade.

The occompanying map and tabulation showing status of District VII freeway projects indicate in a general way the progress that hos been made. To date of Januory 1, 1954, a totol of 133 miles of freeways and expressways have been completed in District VII and 40 miles are under construction. The total sum to date thot has been expended for compieted freeways, freeways in progress and right-of-way acquisition therefor is $259,000,000. The budget for the 1954-55 Fiscal Year recently adopted by the California Highway Commission allocates a total of $63,000,000 for expenditure upon District VII freeways. Thus, the total expended and obligated for District VII freeways is now $322,000,000.

Brief description of the status of each of the District VII freeway projects follows:

Hollywood Freeway

Fully financed and completed, except for one mile now under construction, is the entire 10-mile length of the Hollywood Freeway between Spring Street in the Los Angeles Civic Center and Vineland Avenue in the San Fernando Valley. Construction under contract is in progress between Highland Avenue and Hollywood Boulevard by the Bongiovanni Construction Company with estimated completion of pavement during April, 1954. The exact date depends upon



Looking northwesterly along Santa Ana Freeway, showing Grand Avenue Undercrossing in foreground, Lincoln Avenue Overcrossing and Santa Fe Railroad grade separation shown center left

Looking southeasterly along grading operations for Golden State Freeway in Weldon Canyon. San Fernando reservoirs skirted by Sepulveda Boulevard shown in background.

Looking westerly along the Santa Ana Canyon Freeway, showing in foreground junction with Yorba Boulevard. Santa Ana River in background.

Looking westerly along completed section of Ventura Freeway through community of Agoura. Old state highway now used as local road on left.

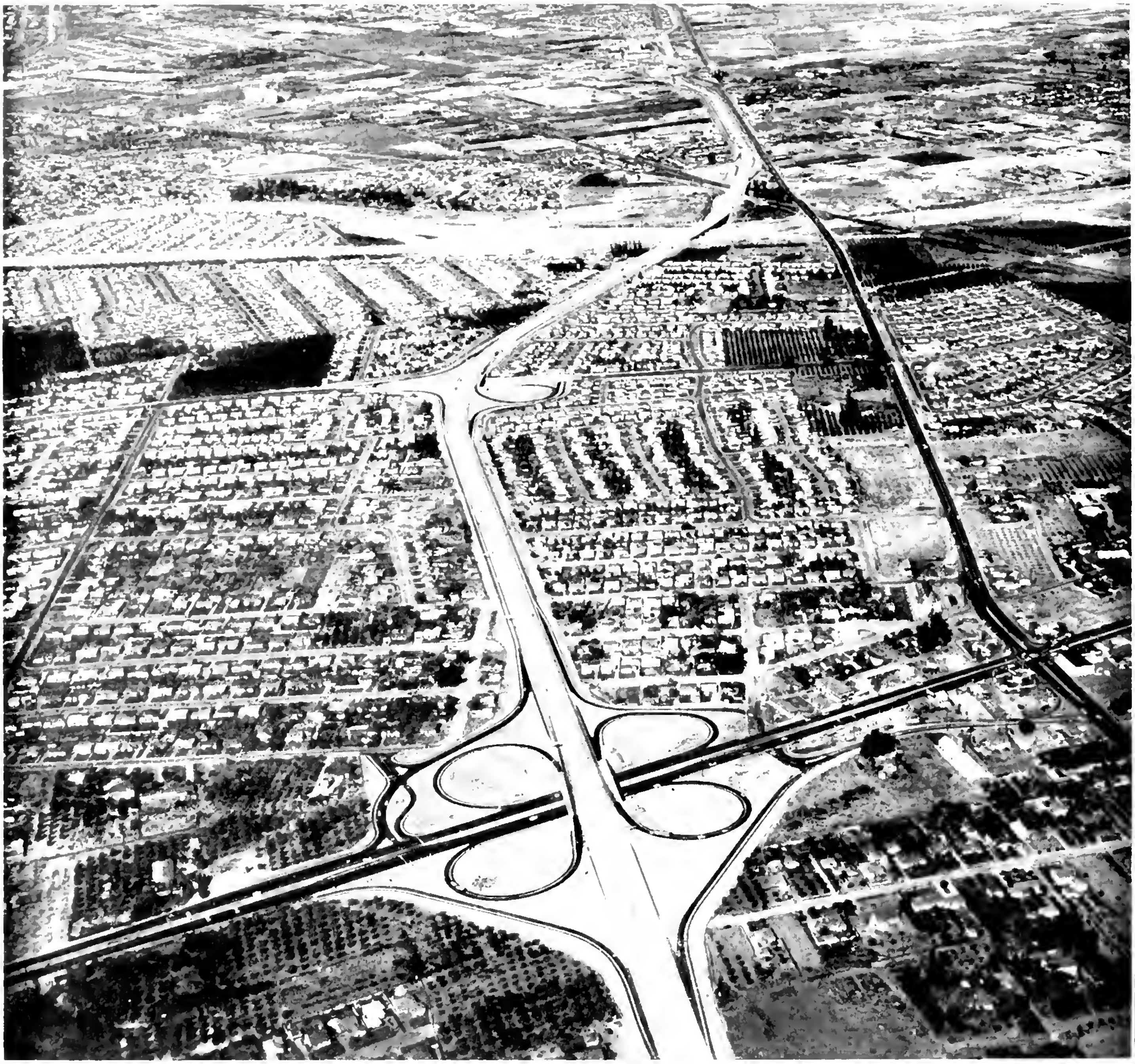
the uncertain weather conditions prevailing at this time of year. Total cost of the completely financed Hollywood Freeway including certain deferred right of way costs is $55,000,000. Traffic count is 125,000 vehicles per day.

The total length of this freeway from Spring Street in Los Angeles to Browning Avenue south of Tustin in Orange County is 35.0 miles and to date $51,000,000 has been expended for right-of-way acquisition and construction. Much of this freeway in Orange County is a limited access ex-

Looking northwesterly along completed Santa Ana Freeway, showing in foreground mixmaster interchange, with Atlantic Boulevard and Union Pacific Railroad being carried over the freeway

pressway with the grade intersections of cross-traffic arterials channelized and signalized. Fourteen miles of continuous full freeway are now open to public traffic on the Santa Ana Freeway between Spring Street in the Los Angeles Civic Center and Pioneer Boulevard in the Norwalk area.

The next section of the Santa Ana Freeway to be completed and opened to public traffic will be the additional two-mile length from Pioneer Boule-



Looking northwesterly along completed Santa Ana Freeway, showing Lakewood cloverleaf traffic interchange in foreground

vard to Rosecrans Avenue. It is anticipated that this will be opened in October, 1954.

In the 1954-55 budget passed by the State Highway Commission at its meeting in Sacramento on November 19, 1953, there is an item of $2,450,000 for widening the existing bridge on the Santa Ana Freeway on Miso Street over the Los Angeles River an additional 42 feet and more, as necessary, to provide for an eight-lane freeway with central dividing strip and with on and off ramps where required. Also in this 1954-55 budget is an item of $1,534,000 to build grade separation structures at signalized intersections of cross-traffic arterials between Rosecrans Avenue and the Orange County line. Another item in this budget provides $3,828,000 for freeway construction of portions between Broadway in Santa Ana and the Orange County-Los Angeles County line. Traffic count on the completed Santa Ana Freeway in the City of Los Angeles is presently 68,000 vehicles per day.

Arrayo Seco Freeway

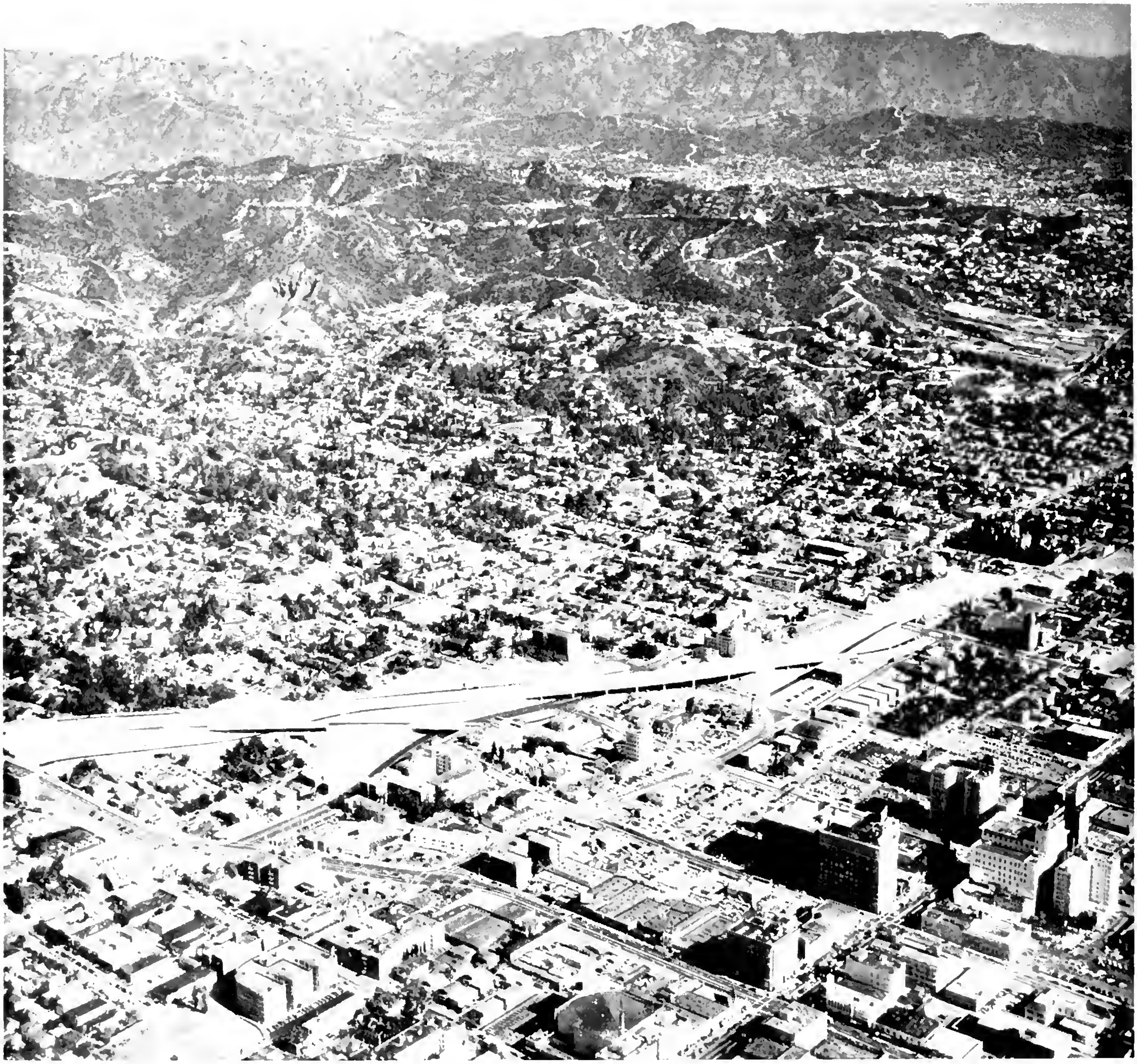
Completed and opened to all traffic throughout entire length of eight miles from the four-level traffic interchange structure in Los Angeles to Glenarm Street in Pasadena. Connection with four-level traffic interchange

Looking southerly along Harbor Freeway. Four-level traffic interchange shown in center foreground.

structure was made on September 22, 1953. On that date for the first time all levels of this unique traffic interchange structure, and all connecting roadways, were put into operation. The total cost of the Arroyo Seco Freeway is $11,000,000. A recent traffic check in a peak evening hour (4.15-5.15 p.m.) indicated that the Arroyo Seco Freeway through the four-lane outbound tunnels carries 8,006 vehicles which is in excess of 2,000 vehicles per lane per hour. This is the accepted basic or theoretical maximum capacity per lane under ideal conditions.

Ramona Freeway

The total length between the junction with the Santa Ana Freeway at the Aliso Street Bridge over the Los Angeles River to the San Bernardino County line is 31.4 miles. The Ramona Freeway is now completed from the junction with the Santa Ana Freeway in Los Angeles easterly to San Gabriel Boulevard in Alhambra, a distance of 8.5 miles. It is expected that the additional mile to connect the Ramona Freeway with Rosemead Boulevard providing a total of 10 miles of completed Ramona Freeway will be ready to open to traffic early in February, 1954. Also under construction on the Ramona Freeway in District VII is the 6.3-mile length through the Cities of Pomona and Claremont from



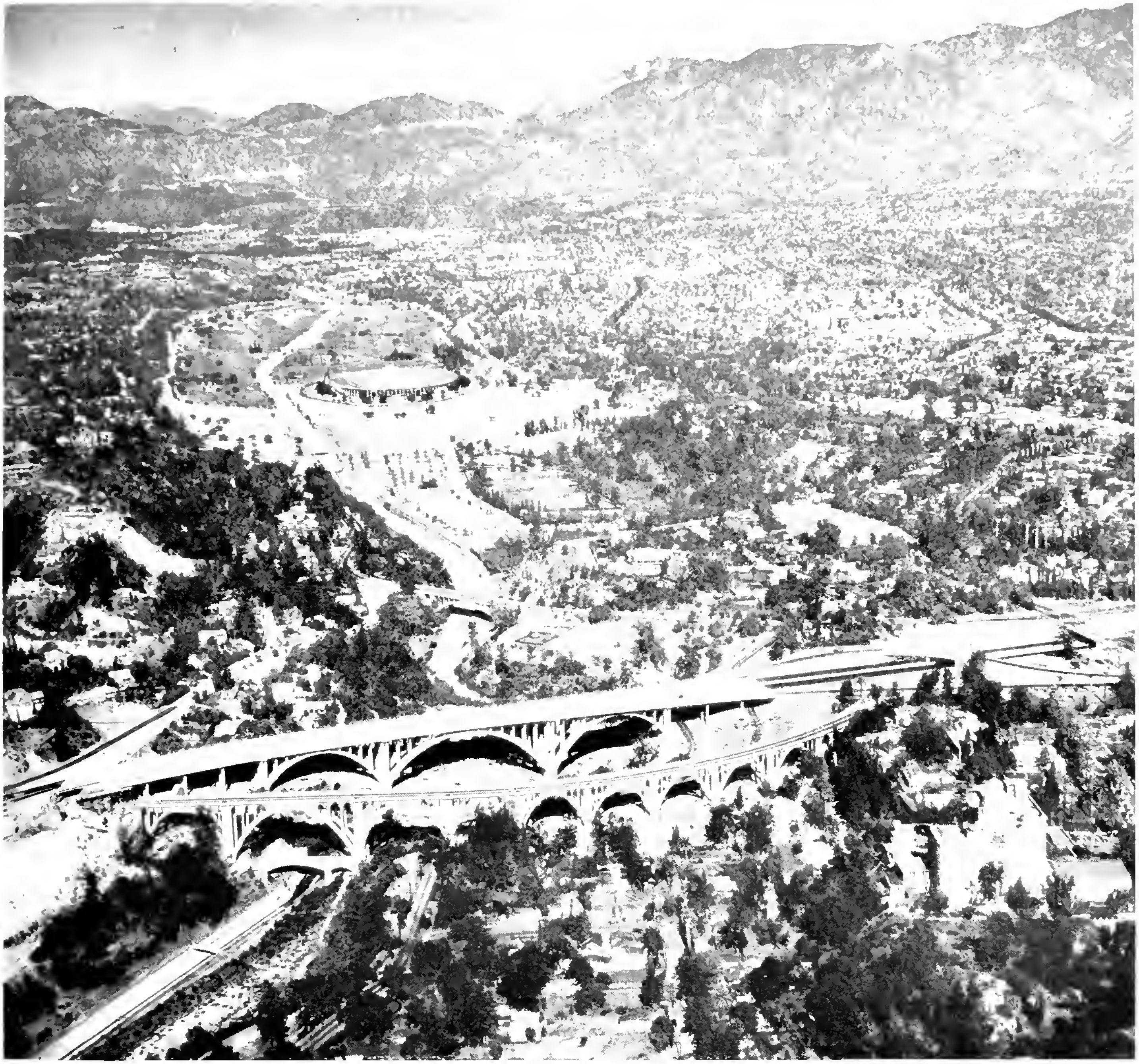
Looking northeasterly from above Hollywood business district, showing completed Hollywood Freeway from Cahuenga Boulevard on left to Gower Street on right. Long viaduct in center carries Hollywood Freeway over Argyle Avenue and Franklin Avenue.

San Dimas to the San Bernardino County line. The scheduled date for completion of this construction is January, 1955.

Including completed freeway contracts under construction and right-of-way acquisition there has been expended on the Ramona Freeway $30,000,000. In the budget for the 1954-55 Fiscal Year there are two items for continuing construction through the City of El Monte extending from Rosemead Boulevard, a distance of 7.3 miles, to Puente Avenue. The total allocation for these two items is $13,050,000. Traffic count on the Ramona Freeway near the Los Angeles end is 52,000 vehicles per day.

Harbor Freeway

The Harbor Freeway from the intersection with the four-level traffic interchange structure near the Los Angeles Civic Center to Battery Street in the San Pedro area is 22.8 miles in length. Of this amount only 0.6 of a mile has been fully completed although southbound traffic is exiting at Sixth Street and at Wilshire Boulevard, while northbound traffic is now entering this freeway at Fifth Street and Third Street. It is expected that a total of one and one-half miles will



Looking northerly along Arroyo Seco, showing old Colorado Street Bridge and new Colorado Freeway Bridge, with Rose Bowl at center left

be completed and opened to traffic as far south as Olympic Boulevard by April 15, 1954. Completion between Olympic Boulevard and 23d Street at Flower Street is anticipated for December, 1954. To date there has been spent or obligated for right-of-way acquisition and construction on the Harbor Freeway the sum of $42,000,000. It is anticipated that early in 1954, financed from an allocation in the 1953-54 budget of $3,660,000, a contract will be advertised and awarded for continuing construction on the Harbor Freeway southerly from 23d Street to 42d Street. In the construction budget for the 1954-55 Fiscal Year there is an item of $4,650,000 for three miles of construction at the southerly end of the Harbor Freeway from just northerly of Pacific Coast Highway (Route 60) to Battery Street in the San Pedro area. Nearly all of the required right of way for this project has been obtained. It is expected that this contract will be advertised and work under way early this summer.

Golden State Freeway

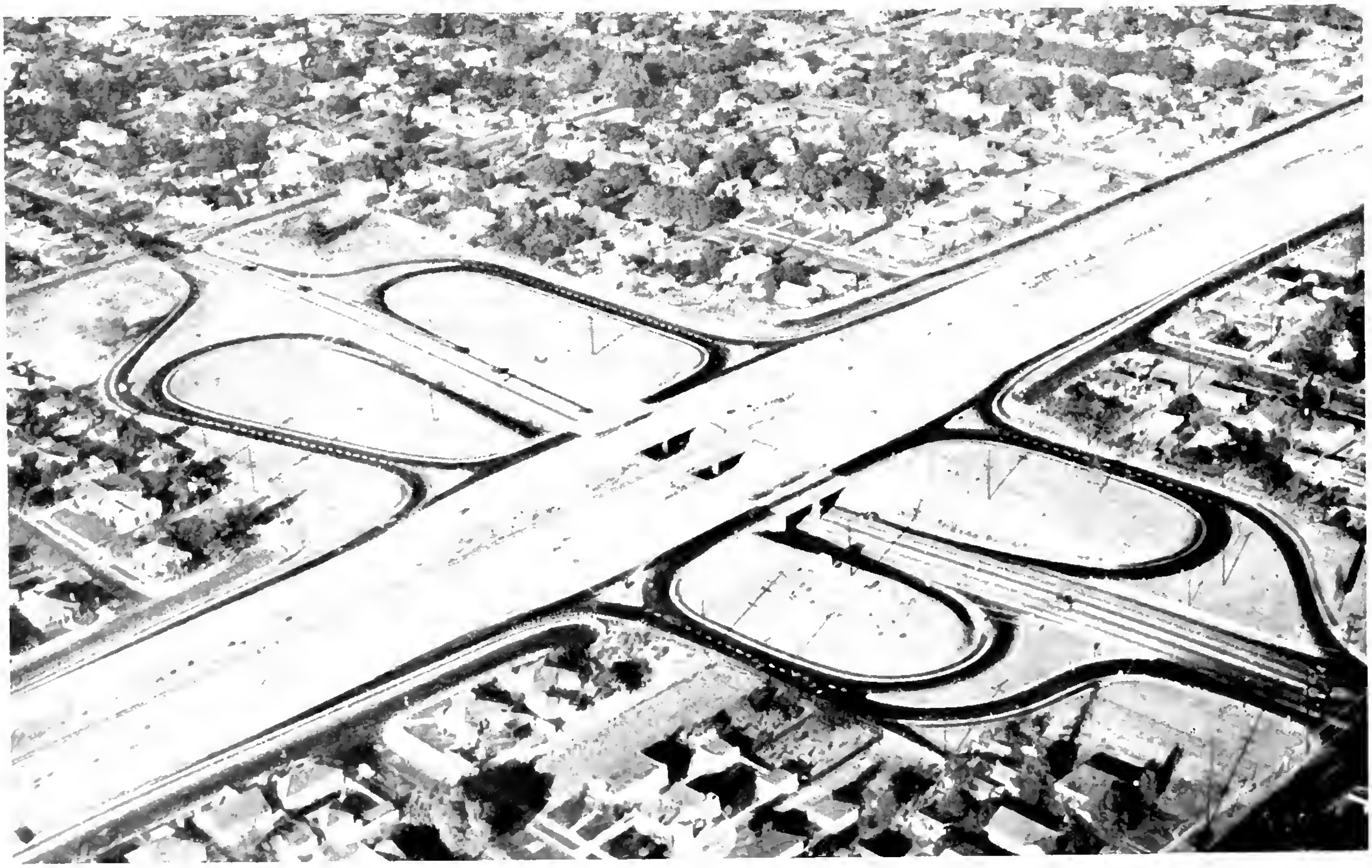
On the portion of the Golden State Freeway known as the "Ridge Route" between Tunnel Station and the Kern County line, 45.2 miles has been converted to a four-lane divided expressway. The total cost of this reconstruction, completed February, 1953, was $13,500,000. Under construction also on the Golden State Freeway southerly of Tunnel Station to provide junction with State Highway Routes 23, 157 and 158 is the construction by Griffith Company, contractors, of 3.0 miles of freeway with a contract allotment of $3,300,000. This is scheduled for completion June 15, 1955. This construction is reported in detail by Resident Engineer Robert H. Butler elsewhere in this issue of *California Highways and Public Works*.

Ventura Freeway

The Ventura Freeway from Vineland Avenue in the San Fernando Valley to the Santa Barbara County line is 61 miles in length. Of this mileage, 22.9 miles have been converted at a

UPPER—Looking northerly along Harbor Freeway construction in progress from Third Street southerly; bridge in foreground carries Venice Boulevard under the freeway. Downtown Los Angeles business district shown center right; City of Pasadena shown in background

LOWER—Ramona Freeway looking northeast, showing cloverleaf traffic interchange at Atlantic Boulevard



cost of $11,000,000 to four-lane divided highway or expressway with limited and controlled access. This completed construction is all westerly of the west city limits of Los Angeles at Calabasas. Within the City of Los Angeles, the State Highway Commission has adopted a freeway resolution covering 10 miles of the Ventura Freeway from Calabasas to Sepulveda Boulevard.

Santa Ana Canyon Freeway

From Newport Beach to the Riverside County line is a distance of 26 miles. Of this distance, a length of 12.9 miles in the Santa Ana Canyon has been completed as a limited access expressway at a cost of approximately $5,000,000. On October 2, 1953, two miles of this freeway at the southerly end through the City of Costa Mesa was completed, also on an expressway basis. The total cost of the construction through Costa Mesa was $800,000. This latter construction was reported by Resident Engineer J. L. Needham in the November-December, 1953, issue of *California Highways and Public Works* magazine starting on page 44.

Sepulveda Freeway

On the Sepulveda Freeway between Venice Boulevard and the Long Beach Freeway, a distance of 33 miles, $5,000,000 has been spent to date for right-of-way acquisition at critical locations in order to acquire rights of way in advance of major improvements to private property where delay would have made future right-of-way acquisition very costly. The first unit of construction on this freeway, between Waterford Street and Casiano Road, will be financed from the allocation of $800,000 in the 1954-1955 budget made by the State Highway Commission at its November 19, 1953, meeting in Sacramento, for construction. An important item in this proposed construction is a grade separation bridge at crossing with Sunset Boulevard.

The State Highway Commission has adopted a freeway resolution extending the Sepulveda Freeway for an additional 39.5 miles into Orange County to a junction with Route 2 near El Toro.

STATUS OF DISTRICT VII FREEWAY PROJECTS

January 1, 1954

	Total miles	Completed projects		Under contract		Right-of-way costs
		Miles	Construction costs	Miles	Construction costs	
Hollywood Freeway; Spring St. to Vineland Ave.	10.0	8.9	$25,933,700	1.0	$3,006,900	$24,151,300
Santa Ana Freeway; Spring St. (Los Angeles) to Browning Ave.	35.0	24.0	27,693,200	9.0	11,750,900	12,089,300
Arroyo Seco Freeway; Four-level structure to Glenarm St. (Pasadena)	8.0	8.0	9,238,000	0.0	52,900	1,009,100
Ramona Freeway; Junction with Santa Ana Freeway—Claremont at San Bernardino county line	31.4	7.6	10,676,000	8.5	8,230,300	11,658,000
Harbor Freeway; Hollywood Freeway to San Pedro	22.8	0.6	6,717,500	2.4	4,758,200	30,994,900
Ridge Route; Tunnel Station to Kern county line	45.2	45.2	11,735,400	---		1,783,000
Golden State Freeway; Olympic Freeway to Tunnel Station	29.8		-	3.0	3,656,700	968,900
Ventura Freeway; Vineland Ave. to Santa Barbara county line	61.0	23.1	6,158,100	9.8	2,038,200	4,786,100
Santa Ana Canyon Freeway; Newport Beach to Riverside county line	26.0	12.9	3,056,100	--	9,000	1,162,800
Sepulveda Freeway; San Fernando Reservoir to El Toro	72.5	0.0	---	0.0	---	5,097,700
Allesandro Freeway; Los Angeles River to Ave. 36 near Eagle Rock Blvd.	1.2	0.0	---	0.0	---	2,005,600
Colorado Freeway; Patrician Way to Kensington Place	1.4	0.3	272,100	1.2	5,192,400	2,127,100
Long Beach Freeway; Pacific Coast Highway to Huntington Drive	21.8	2.8	2,703,400	5.3	7,402,500	10,697,900
Totals	366.1	133.4	$104,183,500	40.2	$46,108,000	$108,531,700

Allesandro Freeway

Right-of-way acquisition on the Allesandro Freeway has been limited to the 1.2 miles easterly of Fletcher Drive between the Los Angeles River and Avenue 36 near Eagle Rock Boulevard. The total expenditure to date for right-of-way acquisition is $2,000,000.

Colorado Freeway

In the City of Pasadena from Kensington Place to Patrician Way, a distance of 1.4 miles, 0.3 mile of the Colorado Freeway has been completed and 1.1 miles is now under construction. This includes the new six-lane freeway bridge over the Arroyo Seco near the Rose Bowl and just northerly of the existing Colorado Street Bridge. This new freeway bridge is nearing completion and two-way traffic is now moving over the northerly half of the new bridge. To date $7,500,000 has been spent or obligated on this freeway. In the budget for 1954-1955 is an item for continuing the Colorado

Aerial view looking northeasterly, showing Harbor Freeway from Seventh Street, foreground right, to Third Street, center left. Los Angeles City Hall and Civic Center buildings, center background.

Freeway westerly from Patrician Way to Eagle Vista Drive in the Eagle Rock area, for which the allocation is $1,320,000.

Long Beach Freeway (Los Angeles River Freeway)

The total length of the Long Beach Freeway from Pacific Coast Highway (Route 60) in Long Beach to Huntington Drive approaching the City of Alhambra is 21.8 miles. As of the present time, 2.8 miles have been completed from Pacific Coast Highway northerly to 223d Street. A length of 5.3 miles is now under construction between 223d Street and the crossing with Atlantic Boulevard east of Compton. Also under construction in the East Los Angeles area are two railroad grade separation bridges to carry the Long Beach Freeway over the Santa Fe Railroad Freight Yards and the Union Pacific Railroad Freight Yards. Both of these structures are about one-fourth mile long and the construction cost of these two is $2,660,000. To date there has been spent on the Long Beach Freeway for right-of-way acquisition and construction $21,000,000. There are two construction items in the budget for the 1954-1955 Fiscal Year. One item is in the amount of $965,000 for construction between Sheila Street and Leonis Street, and the other item is for bridges and connecting roadways over the Santa Ana Freeway between Noakes Street and Verona Street in the amount of $3,085,000.

Foothill Freeway

The first unit of construction on the Foothill Freeway from Hampton Road in the Flintridge area to Montana Street in Pasadena is now advertised with bids to be received February 4, 1954. The item in the 1953-54 budget for this work is $2,722,000.

Looking northeasterly, showing four-level traffic interchange in center of photograph; Hollywood Freeway extending from center left to upper right, and Harbor Freeway and Arroyo Seco Freeway extending from lower right to upper left

CONCLUSION

The accompanying photographs and map portray more concretely the progress on certain sections of the above described freeways. They cannot, however, indicate the extensive right-of-way acquisition being made considerably in advance of future consideration. Nor can they indicate the benefits of the advance right-of-way acquisition program, which represents an entirely separate effort than our regular program of work. Since this advance money for right-of-way acquisition first became available, the State Highway Commission has adopted 138 miles of freeway routes in District VII which would have been impossible to adopt without this protective procedure. At long last the State Division of Highways can step out ahead and make real progress in coordinating its future freeway program with the over-all community planning of local city and county planning agencies.

Any over-all program of metropolitan freeway progress affects the lives of so many of the citizens of the community that even a regular or immediate program requires the most careful planning of each step of the procedure. These steps must follow in orderly sequence to provide an accomplished result. Operations of any step of procedure cannot be turned on and off like a water faucet. Any such large undertaking requires time to organize and gain momentum, and cannot be suddenly stopped without serious consequences to the community. We have well started the momentum of achievement made possible by the additional funds provided by the Legislature at its last session. In view of the urgent traffic needs of all sections of this metropolitan area, it is hoped we will be able to retain the momentum so gained.

Looking northerly along Long Beach Freeway adjoining the Los Angeles River. The bridges in order are Anaheim Street, Pacific Coast Highway, Willow Street, and 223d Street. →

Looking northwesterly along Hollywood Freeway, showing Hollywood business district, center left; bridge at left carries freeway over Gower Street, the long viaduct in center carries freeway over Argyle Avenue and Franklin Avenue. San Fernando Valley is shown in the background. ↓

GOAL OF SAFER SCHOOL CROSSINGS

A booklet designed to enhance cooperative efforts toward the goal of safer school crossings has been published by the Division of Highways Traffic Department.

It is entitled "School Crossing Protection—Signs, Signals and Devices," and brings together for easy reference the basic laws and regulations.

Subjects covered in the booklet include school safety patrols, adult guards, standard signs (illustrated in color) and flashing yellow lights, both permanent and portable.

Copies of the booklet are being made available to school administrators, and upon request to public officials and to individuals and organizations concerned with the safety of school children in traffic.

ICE ON BRIDGES

Winter drivers are warned by the California State Automobile Association to be wary when crossing bridges. Icy spots form more quickly on bridges than elsewhere.

Tulare Bypass

Traffic Congestion Through City Eliminated by Freeway

By ROY F. JOHNSON, District Construction Engineer

Opening of the freeway around the City of Tulare, extending from Tulare Airport on the south to the Tagus Ranch on the north, was accomplished with appropriate ceremonies at 2 p.m., on December 11, 1953.

This completes the first section of full freeway constructed in District VI and will eliminate the bottleneck caused by through traffic going through Tulare.

The ribbon cutting was attended by many local citizens, officials of the Chamber of Commerce of the City of Tulare, with the ribbon being held by District Engineer E. T. Scott and Supervisor Halver Haddock and being severed by Golda Voorhees and Barbara Gilbert, students of Tulare High School.

Stage Construction

Improvement was accomplished as stage construction under four contracts as follows:

(1) Contract 51-6VC5,1, United Concrete Pipe Corporation, Baldwin Park, California, Contractor.

This aerial view shows the Tulare By-pass Freeway

(2) Contract 52-6VC8-F, Gordon H. Ball, San Ramon Valley Land Co., and Trewhitt, Shields and Fisher, Fresno, California, Contractor.

(3) Contract 53-6VC10-F, Guy F. Atkinson, San Francisco, California, Contractor.

(4) Contract 53-6VC13, Howard Electric Co., Gilroy, California, Contractor.

The first contract, which embraced grading, installation of drainage facilities, a grade separation at the intersection of US 99 and State Route 134, and a grade separation at the A. T. & S. F. R. R. about one-half mile north of the Tulare city limit.

Separation Structures

The US 99-134 separation is composed of two parallel structures, each structure consisting of two spans about 134 feet in total length, supported on a reinforced concrete bent and reinforced concrete abutments.

These structures each provide a clear roadway width of 26 feet with one five-foot sidewalk.

The railroad separation structure is of steel plate girder construction, consisting of two spans, supported on a reinforced concrete bent and reinforced concrete abutments.

This contract also included paving Route 134 (Tulare-Lindsay Highway) between Blackstone Avenue and Lane Avenue.

Construction operations were well advanced when the policy of constructing all projects on new alignment on US 99 to full freeway standards was adopted. This required a revision of the plans of this contract, eliminating certain portions of the work and revising others to conform to the proposed freeway plans.

The contract covering the aforementioned work was approved on November 30, 1950, and the completed first stage project was accepted July 30, 1952.

Second Stage of Project

The second stage of this project was authorized under contract 52-6VC8-F and consisted of constructing six overcrossing structures, grading and surfacing bridge approach and other roads, and grading portions of the freeway.

The Airport Overcrossing and Tagus Overcrossing are reinforced concrete box girder bridges, 230 feet long, composed of three spans supported by reinforced concrete abutments and bents with concrete pile foundations. These bridges provide a clear roadway width of 22 feet.

The Hospital Road Overcrossing and Prosperity Avenue Overcrossing are of reinforced concrete box girder construction, 110 feet 6 inches long, each composed of two spans supported by reinforced concrete abutments and a center bent, providing a

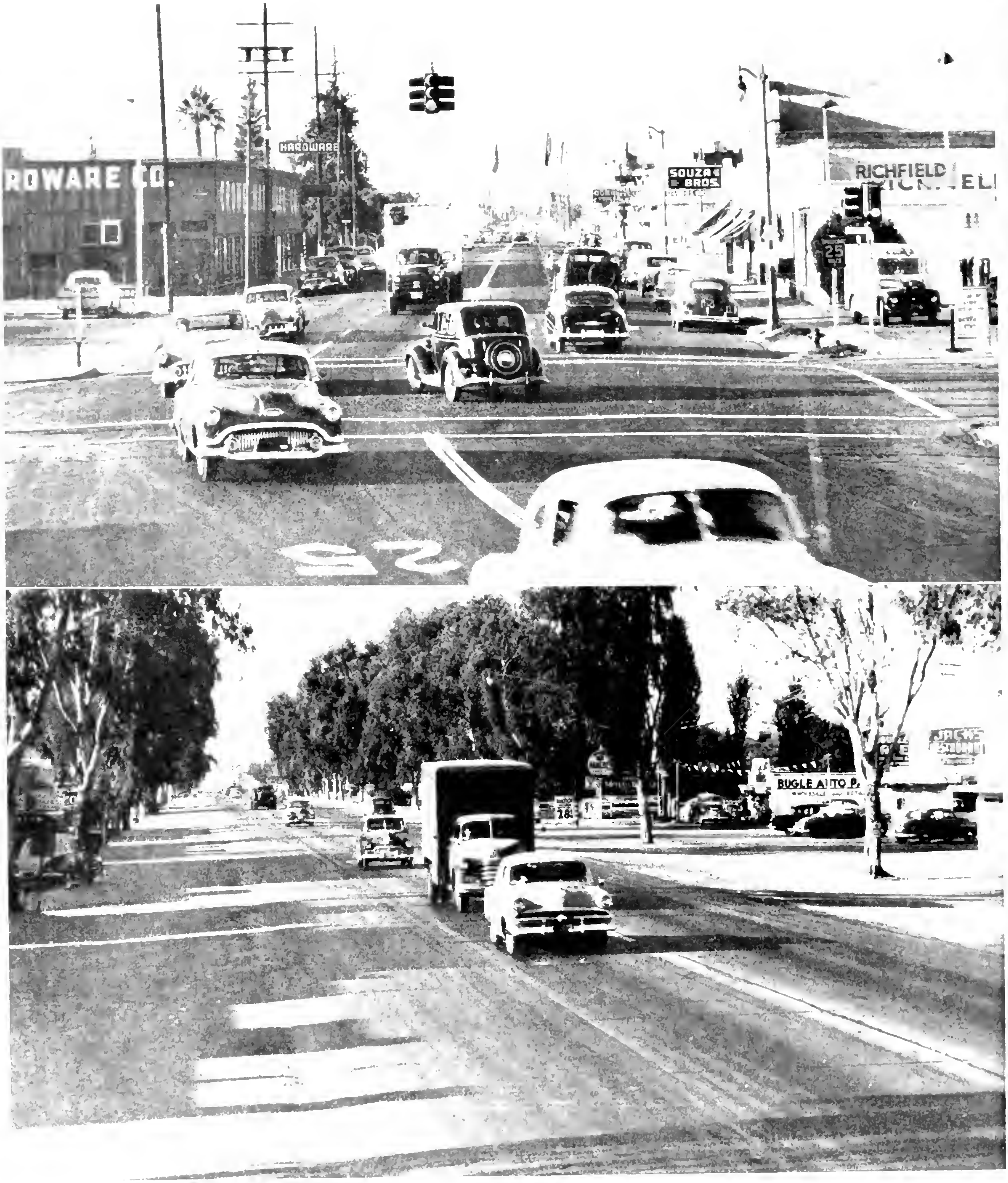
CONSTRUCTION INDUSTRY SADDENED

The Department of Public Works was saddened by the sudden passing on November 25, 1953, of D. L. Morrison, Project Manager for Guy F. Atkinson Co., contractors on the Tulare Freeway.

Mr. Morrison was well known to construction personnel throughout the State, having been closely associated with highway construction for many years.

District Engineer E. T. Scott, left, and Supervisor Holver Haddock hold a ribbon, which is cut by Golda Voorhees, a Tulare High School driving student, as a symbol of the opening of the Tulare Freeway. The other girl is Barbara Gilbert. Persons in the background include, from left, Harold Rainwater, Councilman Carl Miller, Marvin Fulton, John Reed, Councilman Harry Erwin, Tom Hennion, Police Chief Virgil Kelly, Captain W. E. Riley, Harry Richmond. Photo by C. Howell.

UPPER—Looking north from south end of Tulare By-pass. Overcrossing at left leads to business section of Tulare. LOWER—Looking north toward intersection of US 99 with State Sign Route 63, leading to Visalia and Lindsay.



These photographs show the traffic congestion that existed in downtown Tulare before the Tulare Bypass was completed

28-foot clear roadway width with two 4-foot sidewalks.

The abutments and center bent on the Hospital Road structure are on spread footings while concrete pile foundations were utilized in the construction of the Prosperity Avenue Overcrossing.

Cartmill Road Overcrossing is a reinforced concrete box girder bridge, 133 feet 2 inches long, composed of two spans supported by reinforced concrete abutments and a center bent with concrete pile foundations, providing a clear roadway width of 28 feet and one 4-foot sidewalk.

Drainage equipment at Hospital Road and US 99-134 separation consist of electrically operated pumps which discharge into a ditch, two miles long, with gravity discharge into the main canal.

Drainage water at Prosperity Road was pumped into a side ditch from which it was pumped into the Kaweah Ditch.

This contract was approved May 5, 1952, and the completed project accepted August 31, 1953.

Third Stage of Construction

The third stage of this project consisted of constructing portland cement concrete pavement on cement treated base, with plant-mixed surface shoulders, paving the Tagus and Tulare Airport Overcrossings and various ramps and outer highways with plant-mixed surfacing.

The contract for this portion of the work was approved March 16, 1953, and was completed in December.

The final stage of this project consists of furnishing and installing lighting facilities in 11 locations and illuminated signs at three locations along the freeway alignment.

It is of interest to note that this will be the first full freeway to be completed in District VI.

The major items of work required for the entire project consisted of the following:

548,000	cubic yards	Roadway excavation
33,000	cubic yards	Structure excavation
39,000,000	station yards	Overhaul
280,000	cubic yards	Imported earth materials
785,500	pounds	Structural steel
11,000	cubic yards	Portland cement concrete (structures)
19	miles	Fence
1,400,000	pounds	Reinforcing steel
50,000	cubic yards	Portland cement concrete (pavement)

The total cost of this completed project will be about $2,817,076.

The work on this portion of the "Golden State Highway" was initiated under District Engineer E. T. Scott, with C. F. Oliphant as resident engineer in the early stages of construction, being succeeded by R. Windele, who was resident engineer to completion of the work.

T. J. Dunn represented the Bridge Department, being succeeded by Walter Bedel.

Paul Wilcox and Harold Pope were the representatives of the United Concrete Pipe Corporation. William B. Spencer and Wayne Haapala, and Alvin Lee were in charge of operations on Contract 52-6VC8-F. D. L. Morrison was project manager for Guy F. Atkinson Company, and Fred Leach was superintendent for Howard Electric Company.

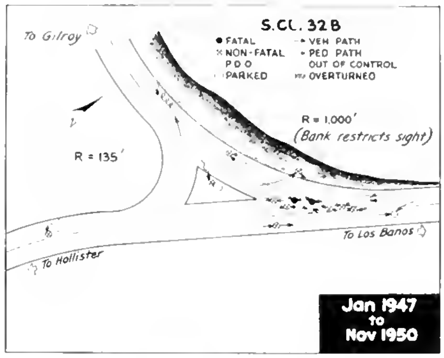
Channelization Reduces Accidents

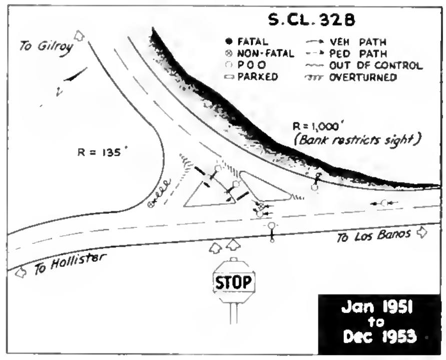
By R. J. ISRAEL, Assistant Traffic Engineer

The accompanying "before-and-after" accident diagrams show the favorable results obtained by channelization of the Don Pacheco Wye, the intersection of the Pacheco Pass Highway with the state highway to Hollister.

The "before" diagram shows a total of 16 accidents at this location for the 3-year and 10-month period, from January 1, 1947, to November 1, 1950. Severity was extremely high; these 16 accidents involving 3 fatalities and 30 persons injured. The primary cause of the accidents was that drivers, eastbound on the Pacheco Pass Highway, had no way of knowing whether the approaching westbound vehicles would pass harmlessly to their left or cut across in front to the Hollister Connection. Although this condition is typical at Y intersections, it was more critical at this location due to the sight restriction imposed by the adjacent cut bank and the fact that the direction of curvature masked a left-turn arm signal.

The correction consisted of the construction of a simple channelization, as shown graphically in the "after" accident diagram and the photograph. Eastbound vehicles were brought to a stop at sufficient distance from the point of the Y to be able to observe the choice of direction on the part of westbound vehicles and proceed only when it was safe to do so. Safety lighting was also placed as a part of the improvement. Work was completed on January 18, 1951.





In the after period, of almost three years, from January 18, 1951, to December 1, 1953, there have been only four accidents at this intersection. Two were property damage only accidents and the other two accidents involved three persons injured.

The total cost of the channelization and lighting at this location was $6,491. This improvement has proved to be a sound investment in traffic safety as evidenced by the marked reduction in the number and severity of accidents.

Motels and Freeways

By JOHN F. KELLY, Headquarters Right of Way Agent

It is axiomatic to the motel industry that no motor court can be a continuing success unless it is well located. It is also a generally accepted theory that good location means a site on a heavily traveled highway. It follows that one of the great worries of the motel operator is that the road system, during a period of economic expansion, will be continually improved and many highways which are major arteries today may be eliminated, bypassed or become secondary routes, thereby destroying the value of his location. These fears undoubtedly are responsible for the recurrence of statements appearing from time to time in motel trade magazines that motels so affected will suffer a loss to the motel operator of from 25 percent to 50 percent * of his gross receipts.

Although considerable thought and analysis goes into the locating of a motel, no factual studies have been prepared up to this time to determine the actual economic effect of an access-controlled highway upon the motels immediately affected or within the area of influence. The majority of opinions and material published to date on the effect of highway revision has lumped together all highways, including freeways, and publicized opinions applicable to neither.

Goal of Study

This study pertains only to the effect of the freeway or the access-controlled highway. For, if a bypass of a community or the realignment of a section of highway is built on a conventional design and does not incorporate the control of access, it will offer unlimited substitute locations for all of the businesses, including motels which formerly fronted on the superseded route. Nor, does this study purport to indicate the effects of the turnpike or toll road wherein highway merchandising is under the control of the toll road authority at designated points along the route. Therefore, the goal of this economic study is not to determine what might be anticipated, but what has actually happened, economically to the motels adjacent to a freeway, with restricted access, and motels which have been bypassed by a freeway.

* See *Tourist Court Journal*, December, 1953.

What Survey Shows

The economic studies previously made on the other types of roadside merchandising, such as service stations and cafes, have definitely shown that there is no direct relationship between the volume of traffic and gross business returns.

This study will show, through the facts obtained from a state-wide motel survey, that a successful motel business is not dependent upon just one, but a number of factors. The type of highway in front of a motel is one of several factors influencing the success or failure of motel business. The records of motels throughout the State have conclusively shown that such factors as management, age, appearance, and location can have a greater influence than the type of highway. This study will also show that with all factors equal, there are motels located on access-controlled highways in California which are more successful than comparable motels located on conventional highways.

Influence of Highway

As the study progressed, it became evident that a motel *site* can be directly influenced by the highway, but the general *location* for that site is not influenced by the highway. The selection of a location is made by the motel owner. If his selection is one of those locations in the State that has become a destination point and a populor place to stop, he has at least located his motel in an area where there are potential customers. The highway may influence individual sites in the area of his selection but will not change the area as a destination point.

The motel industry is one of the primary types of roadside business and should be highway conscious. It is not unusual that motel owners consider the highway the all-important factor which spells success or failure for a motel. Because this feeling exists among many motel owners, they are going to view any change in the highway system in the vicinity of their motel with skepticism. They are justified in feeling this way until facts are developed to prove exactly what economic effect the access-controlled highway has upon the motel industry in California.

The Division of Highways' policy is and has always been to provide the people with the best highway system possible, but not at an excessive cost to one of the large industries in the State which provide services to the highway motorist.

BASIS OF STUDY

The source of factual information in this study came directly from the motel owners. Every motel located on an access-controlled highway except those which had been located on this type of highway for an insufficient period of time to provide adequate records was contacted and requested to provide information from their records to make this factual study. The study also included motels along highway routes which had been superseded by a new highway, and motels located on conventional highways. There are so many motels in this latter category that the survey was limited to those motels on conventional highways located in the vicinity of access-controlled highways. These motels, because of their location, form an ideal group for direct comparison.

A very high percentage of the motels contacted were cooperative in furnishing all information requested. This meant revealing confidential income figures directly from their records. All of these motels were included in the study, except those which reported incomplete or indefinite returns. As a protection to the individual motels, the income figures are reported in the study as percentages and any reference to actual receipts is through group or average figures.

Personal Contact Necessary

Although the personal contact method of obtaining facts for this study required considerable time, it was the only accurate means of obtaining correct gross income figures. Previous economic studies of other types of roadside merchandising could be made without a lengthy survey because of the available source of factual information through the State Board of Equalization. These businesses are required to report their gross income for the purpose of paying state sales tax.

The analysis in this study has not followed the familiar pattern of making a comparison before and after highway construction. Since World War II, the construction of access-controlled highways has become a continuous building program taking place at various locations throughout the State. During this same period of time, a large number of new motels have been constructed in California.

Unit of Measurement

Because of the state-wide character of this study, the variations are of such an extent that it was necessary to develop a unit of measurement which would be applicable to all motels. The only place where direct comparisons could be made were in those areas where stage construction created a situation whereby some motels were facing a freeway and others were still on a conventional highway within the immediate area. In this case, all other economic factors are equally applicable to all motels, the only difference being the type of highway frontage.

One of the most commonly used methods of classifying motel business has been the use of the occupancy factor. This system has merit in providing a guide to motel activity, but it does not furnish the authentic data required for making a factual study. The state-wide survey of motels revealed that a surprisingly small number of motel owners keep an accurate record of occupancy. This is understandable because those motel owners evidently realize that the income record which they keep for taxation purposes is their most accurate business guide. So many motel owners, and justifiably so, reduce their rental rates —sometimes quite drastically—in order to increase the occupancy of their units. The motel owners who refuse to do this might show a much lower occupancy rate, but it does not necessarily mean that their annual gross income is lower.

Test of Motel Success

In the final analysis, the motel, like any other business enterprise, must produce a good return on the investment in order to be a success. Therefore, the most accurate test of motel success is not the occupancy factor but the actual income earned.

The relationship of gross income to those factors which have the greatest influences on the motel industry is the unit of measurement which provides the answer to the question, "what is the economic effect of access-controlled highways upon motels?"

FOUR GROUPS

All facts influencing the income potential for motels were obtained and tabulated. This study included an analysis of the factual information, as well as the estimates and opinions offered by motel owners. Net income has been considered, but investigation has shown that it would be an inaccurate unit to use for comparative purposes because of the variation in management.

The gross income, as the unit of measure, was applied to the motel unit rather than the motel, because of the variance in the number of units available for rent.

After making the personal contacts with motels throughout the State, an analysis was made of all information obtained. As a result, there were a total of 98 motels with complete figures that could be used for making the study.

The gross income for the units of the 98 motels in this study ranged from an average of $355 to $1,744. The method of obtaining the gross income per unit was determined in exactly the same manner for each of the 98 motels; the total annual gross income reported for the motel was divided by the number of units available for rent. To better analyze the gross receipts per unit, the wide range of figures has been divided into four groups.

The motel units which had gross receipts less than $500 comprised the lowest income group. Those units showing annual gross receipts of $1,500 or more comprised the highest group. Between the low and high income groups the gross receipts were divided into two classes; those units with annual gross incomes from $500 to $1,000 and those showing receipts from $1,000 to $1,500.

CHART 1

Gross income per unit	Percent of motels studied	Average gross receipt per unit
Under $500	10%	$355
$500 to $1,000	40%	$707
$1,000 to $1,500	36%	$1,181
$1,500 and over	14%	$1,744
Total	100%	

Chart 1 shows that 10 percent of the total number of motels had gross receipts under $500 per unit and 14 percent of the 98 motels had gross receipts of $1,500 or more.

The largest number of motels in a group, comprising 40 percent of the total, produced an income of $500 to $1,000 per unit. The next largest group, representing 36 percent, had annual incomes of $1,000 to $1,500 per unit.

In addition to the total number of motels in each of the four income groups, *Chart 1* shows the average gross receipts of those motels within each of the income groups.

CHART 2
HIGHWAY LOCATION OF MOTELS IN EACH INCOME GROUP

Gross income per unit	Frontage road	Expressway	By-pass	Conv. hwy.	Total
Under $500	50%	30%	10%	10%	100%
$500 to $1,000	36%	33%	10%	21%	100%
$1,000 to $1,500	31%	29%	14%	26%	100%
$1,500 and over	50%	29%	0	21%	100%

Segregation of Motels

A segregation of the motels within each income group has been made with respect to the type of highway where they are located. *Chart 2* shows

PHOTO 1—Motel on expressway near Vacaville. Access restriction along expressway requires motorists to drive on intersecting road to enter motel property. In the left portion of photo the entrance is identified by stone pillars.

that 50 percent of the motels in both the low and high income groups were located on frontage roads. On expressways the tabulation shows that within the low and high income groups the percentage number represented was nearly the same. The survey showed 10 percent of the low income motels, but none of the high income motels, located on bypassed highways. Ten percent of the low income group and 21 percent of the high income group were located on conventional highways.

The motels in the two middle income brackets, $500 to $1,500 per unit, comprised 76 percent of the total number of motels in the study. Approximately two-thirds of the gross returns of these middle income groups were from motels located on frontage roads and expressways.

A separate tabulation of the total gross income of the 98 motels in this study discloses that *69 percent* of the total income was derived from the motels located on access-controlled highways.

The dominant factors affecting motel business are the highway influence, age, management, size, competition, and traffic. In addition to these factors, there are other influential items which should be given consideration in analyzing the motel industry, such as commercial business, motor travel association, kitchens and garages. Each factor will be shown in detail as it influenced the motels in this study.

HIGHWAY INFLUENCE

Whereas *Chart 2* reveals the highway location of motels in each income group, *Chart 3* shows the percentage representation by income group of the motels located on each type of highway. For example, 37 of the 98 motels in the study were located on frontage roads. Therefore, the 37 represent 100 percent of the motels on frontage roads.

According to this chart, 13 percent of the motels on frontage roads had incomes under $500 per unit, whereas 19 percent had incomes of $1,500 or more. The remaining 68 percent of the motels on frontage roads were in the two middle income groups.

CHART 3

Gross income per unit	Frontage road	Express-way	By-pass	Conv. hwy.
Under $500	13%	10%	10%	5%
$500 to $1,000	38%	43%	40%	38%
$1,000 to $1,500	30%	33%	50%	43%
$1,500 and over	19%	14%	0	14%
Total	100%	100%	100%	100%

The income group representation on expressways followed a pattern similar to the motels on frontage roads. A comparison of the income representation of the motels on access-controlled highways shows that the majority had incomes between $500 and $1,500 per unit.

Ninety percent of the motels located on bypassed routes were also in the middle income bracket. According to the chart, only 10 percent of the motels bypassed had incomes under $500 per unit, and none of the motels in this group produced incomes of $1,500 or more.

Irrespective of the influence of such factors as age, management, size, etc., *Chart 3* is a representative comparison between the access-controlled highways and conventional highways throughout the State.

AGE

Age is considered a strong factor influencing the success of a motel because of the close association of age and appearance. This close association does not necessarily mean that the two are synonymous. Many older motels have been remodeled and normal maintenance kept at such a high level that they remain in direct competition to the newest Class A motels. However, as this type of management is the exception, *Chart 4* does not make allowances for the remodeling, but indicates the average years of actual operations for each income group.

CHART 4

Income gross per unit	Average age
Under $500	7.5 years
$500 to $1,000	7.8 years
$1,000 to $1,500	5.8 years
$1,500 and over	3.9 years

The facts presented in *Chart 4* clearly show that the highest income group also represents the newest group of motels. The oldest motels in this study were in the next to lowest income group. Those motels in the lowest income group were found to be only slightly newer than the oldest group; whereas the difference in age between the other income groups is considerably greater.

Our study indicated that it was not impossible to apply corrective measures to offset this income-age ratio. The average motorist, upon reaching his destination, will generally select the most attractive motel available. Although older motels may be as well maintained as a new one, the motorist's selection is primarily based upon the general appearance which indicates the age.

To offset this factor, the owner-manager of a successful older motel recently stated that it was necessary to spend several thousand dollars each year in modernizing his motel units. The expense was required so that this older motel could compete with the new motels being constructed in the nearby vicinity. This motel operator further stated that his motel was a Class A business several years ago, but it would have a Class C rating today if he had only performed necessary maintenance.

A new motel does not automatically signify a high income. However, with all other factors being equal, the new motel has a better chance to succeed because the appearance serves as a great inducement to the highway motorist.

MANAGEMENT

Management can be considered one of the factors which most strongly influences the success of a motel. In fact, the survey revealed several cases where poor management caused such an adverse effect upon the reputation of a particular motel that considerable time and money was required by new managers to overcome this handicap.

Chart 5 shows the average length of time for current management of the motels within each of the income groups.

CHART 5

Income gross per unit	Average management
Under $500	2.6 years
$500 to $1,000	4.9 years
$1,000 to $1,500	4.0 years
$1,500 and over	2.4 years

A comparison of *Charts 4 and 5* shows that the relationship between management and age of motels follows a definite pattern. The difference between age and management becomes progressively smaller with each higher income group.

The highest income group reflects a relatively close relationship between motel age and length of time for management. This relationship, as compared with the wide difference in the low income group, indicates that the older motels are undergoing the greatest turnover in management and ownership. For example, there is a difference of 4.9 years between age and management in the low income group, whereas the difference is only 1.5 years in the high income group.

The combination of age and management, and the consistency of their pattern, as shown on *Charts 4 and 5*, have such an overwhelming influence on the success of a motel that they tend to overshadow all other factors, including the type of highway.

SIZE

In use of the gross receipts per rental unit as the basis of comparison, consideration was given to the size of the motel. The purpose of bringing this factor into the study was to see if the number of units at a single location could substantially influence the gross returns.

Chart 6 shows the average number of units for the motels within each income group.

CHART 6

Gross income per unit	Average number units per motel
Under $500	11.6 units
$500 to $1,000	11.8 units
$1,000 to $1,500	16.7 units
$1,500 and over	15.3 units

The figures in *Chart 6* show that the higher income groups consist of larger motels than the lower income groups. Among the many reasons attributable to the fact that motels with a greater number of rental units are showing higher gross receipts, the following reasons seem to have the greatest merit:

1. Certain overhead items in the operation of a motel are static, regardless of the number of units available for rent.
2. More units would permit the owner to accommodate regular commercial trade all seasons of the year and thereby increase the occupancy during those months when the tourist trade is poor.
3. A large motel could provide a greater variation in rates and thereby appeal to a larger group of motorists.

No evidence was found in making this study to indicate that the type of highway on which the motel was located had any bearing upon the size of the motel. In making the personal contacts to obtain the factual information, it was interesting to note that the motel owners' opinions were both for and against highway changes which were said to contribute both to the increase and the lack of expansion of motels.

COMPETITION

Many opinions have been written on the advantages and disadvantages of competition in the motel industry. Regardless of whether you feel a competitor nearby is good or bad for business, it is interesting to observe the location of competitors to the motels in this study as shown in *Chart 7*. It is obvious that the distance to a competitor has very little influence upon the gross receipts of a particular motel group whether the income is low or high.

CHART 7

Gross income per unit	Average distance to nearest competitor
(A) Under $500	0.71 mile
(B) $500 to $1,000	0.77 mile
(C) $1,000 to $1,500	0.50 mile
(D) $1,500 and over	0.72 mile

Observations made during this survey indicate that competition can become an asset rather than a liability to the motel operator. The facts obtained show that in general, a group of motels will be more successful than a single motel, when the location is some distance from a city or a natural stopping point such as a major highway intersection. A few exceptions where the single motel was able to attract a large volume of business were in those cases where there were a group of other businesses in that area which could accommodate the motorist for an overnight stop. A few examples were found where the motel operator, through heavy investments, was maintaining the necessary businesses allied to the motel in order to develop his particular site as an attractive stopping place.

Value of Frontage Road

The frontage road offers the opportunity for the development of a group of businesses which will permit motorists to obtain the services they need by making a single stop. At several locations in the State where frontage roads have been installed, property owners are constructing businesses which cater to the motorists. Such a development gives the traveler the opportunity to select the services he needs without making dangerous stops along the heavily traveled highway.

The motorist following an auto association guide book, or one who is familiar with the general location of motels throughout the State, will generally drive until he reaches an area where there are ample motel accommodations. So many motorists travel without previously making reservations for motels, that their only safeguard is in numbers. These motorists, in the majority of cases, will not drive a considerable distance further to a single motel because of the risk of not finding a vacancy or being forced to take what is available.

In those few cases where motel operators complained of there being an oversupply of motel accommodations in a specific area, we found that age and management factors were the real reason for the complaint.

PHOTO 2—Motel along expressway in Escondido. Fence across front of property confines motel entrance to side street. Entrance visible in right center portion of photo beyond expressway intersection.

TRAFFIC

Based upon a weekday, 16-hour count in July, 1953, the exact number of vehicles passing by each of the 98 motels in this study has been computed. The average number of vehicles passing in front of each of the four income groups is shown in *Chart 8*.

CHART 8

Gross income per unit	Average number of vehicles
Under $500	12,365
$500 to $1,000	12,779
$1,000 to $1,500	12,836
$1,500 and over	11,868

The figures in *Chart 8* show that a large volume of traffic does not necessarily signify large business receipts for motels. This is apparent when the highest income group appears in the area of lowest traffic volume. A review of the figures in the chart shows that there really is not an appreciable difference in the volume of traffic between the lowest and highest income groups.

The purpose of presenting the actual traffic volume within each income group has been to show that when traffic is used as an aid to the selection of a motel site, the volume of traffic cannot be relied upon as any indication of anticipated business receipts. Perhaps the only time when the number of vehicles can provide any assistance in the selection of a motel site is when the traffic count reveals an extremely small or exceedingly large number of vehicles. It is obvious that the lack of traffic would not provide adequate customers to support a motel or any other roadside business. Likewise, an excessive number of vehicles would create congestion to the point of actually hurting roadside businesses. This fact was found to be the case in several previous economic studies where there was conclusive evidence that when volume of traffic increased to a point of congestion, business receipts had a tendency to decrease proportionately.

Character of Traffic

The *character* of traffic is the primary consideration when traffic is used as an aid in the selection of a motel site. In other words, a sizable proportion of the traffic passing a motel site must consist of motorists who are potential customers. If a high percentage of the traffic consists of local vehicles, very little, if any, business can be anticipated from this type of motorist. On the other hand, if the majority of the traffic volume passing a motel site is made up of potential customers, the likelihood of success from the traffic standpoint is very good, assuming that there is a reasonable amount of traffic and that the other factors influencing the success of a motel are favorable.

COMMERCIAL BUSINESS

The difference in bookkeeping methods used by motels made it impossible to obtain accurate statistics on the amount of commercial business at each motel. Rather than eliminate the item, the motel owners' estimated percentage of the commercial business has been included. This has been done because commercial business does constitute a portion of motel gross receipts.

Nearly all of the motels included in this survey welcome commercial travelers, and in many cases offer special rates for their accommodation. According to many motel owners, the commercial trade constitutes a considerable portion of their business during the winter months when the volume of tourist traffic is low. The few motels which do not encourage commercial trade were those having a small number of units available for rent, and felt they could not afford to fill their units at commercial rates. The motels located near cities reported the highest estimates of commercial business. Motels located in the rural areas reported the lowest amount of commercial trade. Those motels which reported a considerable volume of commercial business stated that the majority of these guests stopped several times during the year. These customers were anticipated, and the motel owners, as a courtesy, assumed the obligation of providing them accommodations without reservations.

The percentages shown in *Chart 9* represent an average of the estimated commercial business within each of the four income groups.

CHART 9

Gross income per unit	Estimated commercial business
Under $500	14.0%
$500 to $1,000	6.4%
$1,000 to $1,500	22.0%
$1,500 and over	12.5%

It is obvious from the percentages shown in *Chart 9* that figures based upon estimates and opinions present considerable variation. However, it should be safe to say that every income group enjoys a certain amount of commercial business. The only indisputable fact pertaining to commercial business is that the factor of location is paramount. It is the custom of this trade to patronize a good motel close to the center of population. Whether this motel is located on a conventional highway, frontage road, or freeway has no direct bearing. In some cases this trade will shift to the newer motels in the vicinity of a freeway, but only if the distance from the center of population is comparatively equal. If the bypass is completely removed, the motels on the former highway will retain this type of patronage in its entirety.

MOTOR TRAVEL ASSOCIATION

This state-wide motel survey included a tabulation of the number of motels which had secured a recommendation from one or more of the motor travel associations. *Chart 10* shows the percentage number of motels within each of the gross income groups which are listed in one of the motor travel association guide books.

CHART 10

Gross income per unit	Average number recommended
Under $500	21%
$500 to $1,000	28%
$1,000 to $1,500	63%
$1,500 and over	79%

The trend revealed in *Chart 10* suggests that recommendations by one or more of the motor travel associations have a direct relationship to gross receipts. A motel listed in the travel guide books definitely indicates two things:

1. The motel has met certain standards with respect to attractiveness and cleanliness.
2. A fee has been paid by the motel to join the association.

Affiliation with one of the travel associations is a form of advertising. Because it is advertising and a fee is required, some motel owners have stated they prefer to spend money for this purpose through some other medium. Therefore, no published recommendation by a motor travel association can mean that the motel owner prefers another form of advertising, or it could mean that the motel is not acceptable. In the case of new motels, a recommendation may be pending.

In making the survey, several excellent motels and some with very high gross receipts were found to have no affiliation. The number of motels recommended by the auto associations show that it is a very popular form of advertising. The ratio between the number of motels recommended and gross receipts indicates an acceptance by the motorists that those motels have attained desirable standards.

The recommendation of motels by the auto association does not make any reference as to whether the motel is located on an access-controlled or conventional highway. Segregation of motels by income groups revealed that the type of highway where the motel was located does not influence the requirements needed by the motel for a recommendation.

KITCHENS AND GARAGES

The motel along the modern highway is to the motorist what the wayside inn was to the highway traveler many years ago. The old inn always provided food as well as shelter. Likewise, many modern motels have all of the facilities capable of providing for all the motorist's needs. A study of the motel industry would hardly be complete without including statistics on kitchens and garages.

Chart 11 shows the percentage of kitchens and garages of the total number of motel units in each income group. The term "garage" includes any type of auto shelter.

CHART 11

Gross income per unit	Kitchens	Garages
Under $500	22%	55%
$500 to $1,000	39%	29%
$1,000 to $1,500	22%	19%
$1,500 and over	8%	6%

The primary reason for including the kitchens and garages in the survey was to see if their presence reflected any pronounced influence upon the gross receipts. Due to the climatic conditions in most sections of California, garages are not a necessity, therefore, they do represent an added investment for extra convenience to the motorists. Kitchens also represent an added investment, catering to a certain group of motorists who desire these accommodations.

The facts shown in *Chart 11* do not establish an obvious trend with respect to kitchens. Considering the percentage of the total number of motels in the study within the four income groups, there is evidence that the greatest number of kitchens are in the lower income groups, and there are only a small number of kitchens in the higher income groups.

The survey revealed several motels were installing a community kitchen as a courtesy to travelers who are on a special diet and people traveling with small children.

The owners of several of the older motels in this study have stated that they cannot compete with the new de luxe motels for tourist and commercial trade. To compensate for this loss, these older motels are renting the kitchen units on a semipermanent basis. Many of these motel owners have stated that in order to rent any units, it was necessary to have kitchens available.

It is difficult to show the influence of kitchens on gross receipts, because many motels with a number of kitchen units are being rented on a weekly or a monthly basis, and oftentimes show a lower gross return than those which are rented entirely on a day-to-day basis.

The percentage number of garages in each of the income groups follows a very definite trend. The lowest income group shows a large number of garages in relation to the units for

PHOTO 3—Motel on frontage road at Buellton. The arrow sign in extreme left portion of photo marks frontage road opening into through traffic lanes.

rent, whereas the highest income group has an exceedingly small number of garages. Referring to *Chart 4* on age of motels, we find the newest motels in the high income group. By comparison it becomes apparent that the trend in new motel construction is to reduce the number of garage facilities.

FRONTAGE ROAD VS. CONVENTIONAL HIGHWAY

One of the most interesting phases of the study has been the direct comparison of motels on a frontage road with comparable motels on a conventional highway in the same general location. The example used in this study is on US 40 in the North Sacramento area. The frontage road along the completed portion of the freeway is adjacent to a three-lane conventional highway. *Diagram No. 1* shows this portion of US 40. The through traffic lanes of the highway are shown across the center of the diagram and the frontage road adjacent to it is indicated by the black line. The black squares show the location of the motels along the two types of highways.

The frontage road is separated from the highway by concrete curbs. Large shrubs and trees are planted in the area between the curbs to provide a barrier which will confine the entrances into the frontage road at designated openings. A view of this planting strip between the highway and frontage road is shown in *Photo No. 4.* The motels in this area are approximately 4.5 miles from Sacramento.

The motels along the frontage road and those adjacent to the conventional highway are influenced by the same volume of traffic, the same neighborhood, approximately the same distance from the nearby city; in fact, all economic influences are relatively the same. The only real difference, aside from individual characteristics, is the type of highway in front of the motels.

Rating of Motels

This direct comparison offered a total of nine motels; four on a frontage road and five on an adjoining conventional highway. Listing these nine motels according to annual gross receipts per unit, the first, second and third highest incomes were made by three of the motels on the frontage road. The other motel on the frontage road placed seventh. The five motels on the conventional highway rated fourth to ninth.

The motel on the frontage road which placed seventh in the order of income per unit was the oldest motel, in fact, 12 years older than the next oldest motel in the entire group of nine. Because of its age, many units are rented on a semipermanent basis. This type of guest is more concerned with location and its relationship to his employment. Therefore, the type of highway has little influence on this motel.

CHART 12
HIGHWAY LOCATION OF MOTELS ACCORDING TO INCOME

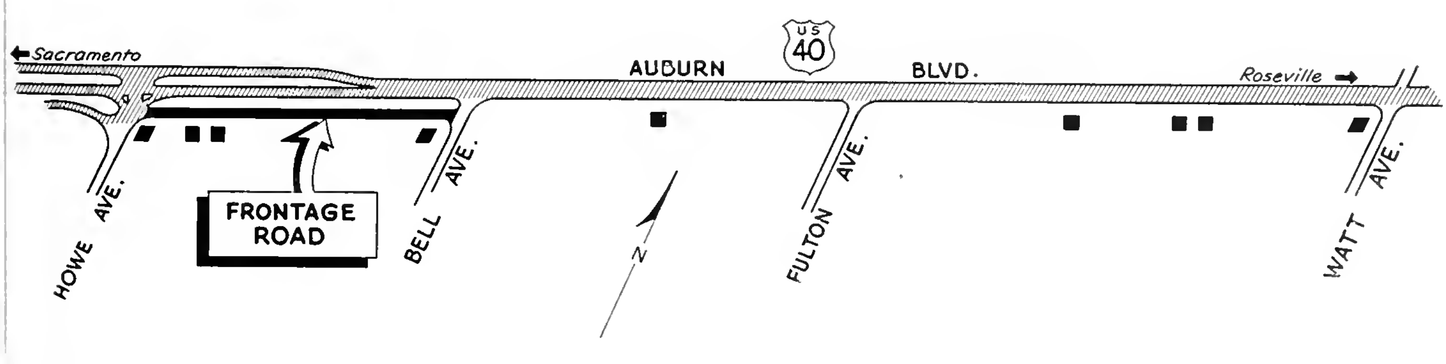
1st—Frontage road
2d—Frontage road
3d—Frontage road
4th—Conventional highway
5th—Conventional highway
6th—Conventional highway
7th—Frontage road
8th—Conventional highway
9th—Conventional highway

Comparisons on US 40

A direct comparison between an access-controlled and conventional highway would necessitate all things being equal on both highways. This would be the perfect situation and one that rarely exists. The example in this study, along US 40, approaches this ideal situation better than any other location in the State. That is, only *one* change is required in order to make an accurate direct comparison. The one motel on the frontage road which is so much older than all other motels on both highways must be eliminated in order to make an honest comparison and not throw it completely out of balance. For instance, a comparison of the age shows that the five motels on the conventional highway average 6.4 years in age. Excluding the oldest motel on the frontage road, the average age for the other three was 4.2 years. The average age for the motels on the frontage road would be 8.13 years if the oldest motel was included. This one motel, if included, would make a change of nearly 100 percent in the total average age. For one item in a comparison to create such a drastic change in the total average means that either it is correct and all others are wrong, or the others are relatively within a comparative base and that one single item should be excluded to avoid a completely unbalanced comparison. Elimination of this motel makes it possible to have a fair and just comparison between motels on a frontage road and on a conventional highway.

Chart 13 shows a direct comparison between the five motels on the conventional highway and three motels on the frontage road. The chart reveals the relationship between the motels on the two types of highways and the influence of several important factors upon their business. The figures

DIAGRAM No. 1—Frontage road on freeway and a conventional highway in the North Sacramento area. Black squares show location of motels adjacent to the two different types of highways.



shown on the chart are averages for the motels on both types of highways.

CHART 13

Factors	Three motels Frontage road	Five motels Conven. hwy.
Age	4.20 years	6.40 years
Management	2.75 years	2.85 years
Size	24 units	12 units
Commercial business	52%	9%
Automobile association recommendation	100%	60%
Kitchens	27%	40%
Garages	38%	17%

The three motels on the frontage road in *Chart 13* show a closer relationship between age and management than the five motels on the conventional highways. This resemblance to the pattern established by all of the motels in the state-wide study, as shown in *Charts 4 and 5*, substantiate the fact that longer periods of management offer better chances for success in the motel business than short-term management.

According to *Chart 12*, the three newer motels on the frontage road have the highest gross income per unit of all the motels. The question arises, then, just how much higher was this income? The average gross income per unit for those three motels on the frontage road was 71 percent greater than the average gross per unit of the five motels on the conventional highway.

The high gross income for the motels on the frontage road, as compared with those on a conventional highway, is startling, particularly when we find that there are not any other allied businesses to attract the motorists into the frontage road area, such as a large service station or cafe. As previously stated in this article, a frontage road lends itself to the development of a number of businesses which can furnish a complete one-stop service for the motorists. The ease of moving from one site to another on the frontage road tends to help those businesses on the frontage road which may not initially have attracted the motorist from the through traffic lanes.

MOTEL OWNERS' COMMENTS

In obtaining the facts for this statewide motel study through personal interview, it was made known that any comments would be welcome. In general, the comments were sincere and reflected the belief and attitudes of those persons making them at the time of the interview. Experience with other opinion polls has indicated that the best which could be derived from this method was a certain similarity to the actual facts. A tabulation of these comments has been made to see if they followed a pattern which might indicate a definite trend of thought. The results were inconclusive, and are included for information purposes. Many of the remarks centered around the principal factors mentioned previously in the study as having the greatest influence on the motel business.

It is noteworthy that certain influencing factors were mentioned more often than others. Those items most frequently stated voluntarily indicate what is uppermost in the thoughts of the motel owners. These items are listed in the order in which they most frequently were given:

Repeat Business—Motel success requires repeat business in both tourist and commercial trade.

Restaurants—Essential to have eating facilities near motel.

Location—Comments emphasized need for good location. A motel owner on US 99 sold his new motel in exchange for a much older motel in a better location. He claims the change increased his gross income $5,000 annually. Incidentally, the older motel which he purchased was located on a frontage road.

Size of Motel—The general comment by owner-operated motels without additional help is that 10 units are the maximum they can handle. Many owners with six- and eight-unit motels complain they were too small. Others remarked that a minimum of 10 units were required in order to make the business pay.

Management—All comments expressed the importance of good management for success.

View—Visibility from highway motorist to motel appears to be a "must" according to the comments.

Age—With the construction of new motel units, the older motels are finding it increasingly difficult to compete for overnight guests. Many owners of older motels remark that it is better to rent units to semipermanent guests.

Competition—The only complaint was by the owners of older motels. In general, the motel owners accepted competition as a natural occurrence in any business enterprise.

Highway Grade—General comments by motel owners located along either an up or down grade felt it was a poor place for business. Traffic either moved too fast or the entrance was hazardous.

Commercial Business—Comments followed two distinct patterns. (1) Motel must be near a city to get commercial business. (2) Small motels can't afford to be filled during the summer at commercial rates. Commercial business is the "mainstay" during winter months.

Traffic—Principal comment came from motel owners along conventional highways. They estimated considerable business was lost from motorists on opposite side of highway unable to cross the heavy traffic.

Noise—Comments about equally divided between disadvantage of being close to highway with noise, as compared with being situated away from highway free of noise but losing business because of distance.

Uninformed Motel Purchasers—A surprisingly large number of motel owners remarked that they purchased their motels without previous experience in motel business and without being provided a record of how much income the motel was producing.

If not given voluntarily, comments were asked for regarding *kitchens and garages*. There was a wide variation in remarks on kitchens. In general, the newer motels are reducing number of kitchens. Older motels are relying on kitchens to keep units occupied. The remarks were 10 to 1 in favor of eliminating garages.

In addition to the voluntary remarks made, the motel owners adjacent to access-controlled highways were asked to comment on the physical characteristics peculiar to that type of highway, such as fences, entrances, etc. Because there were comments from all of these particular motel owners, it is impossible to list them in the order of how frequently they occur. However, a brief generalized summary of each item will in-

. . . Continued on page 36

US 395

Reconstruction in Riverside County Has Been Rapid

By J. DEKEMA, Assistant District Engineer

COMPLETION of the "Perris Bypass" portion of US 395 was taken in stride without public ceremonies by California's motorists who have become used to accepting, without question, the rapid improvement and complete realignment of this major highway that has been in progress since the end of World War II. Contracts between the Riverside-San Diego county line and the City of Riverside have been awarded in a continuous series, with two contracts completed late in 1953. The construction between Sign Route 74 south of Perris and Nuevo Road north of that city was finished by the E. L. Yeager Company of Riverside on September 30, 1953, 50 days ahead of schedule, at a cost of $762,000. Similar to previous projects in this route, construction consisted of building two lanes of an ultimate four-lane divided expressway on a 142-foot width of right of way with the number of intersections kept to a minimum.

Perris Is Bypassed

The new highway bypasses the city to the east, with easy access provided for traffic entering and leaving town. An interchange north of Perris was constructed to eliminate conflicting traffic movements. Another grade separation was provided at Perris Boulevard to permit local traffic and school children to cross the high-speed new facility with safety.

Perris Valley was settled in the eighties, coincident with construction of the California Southern Railway which provided a short route from the San Bernardino Valley to San Diego by way of Perris, Elsinore, and Temecula. The original railroad station was at Pinacate about two miles south of the present town, which was laid out and subdivided about 1890. The station was moved and renamed to honor Fred T. Perris, Chief Engineer for the railroad.

Originally Mining Town

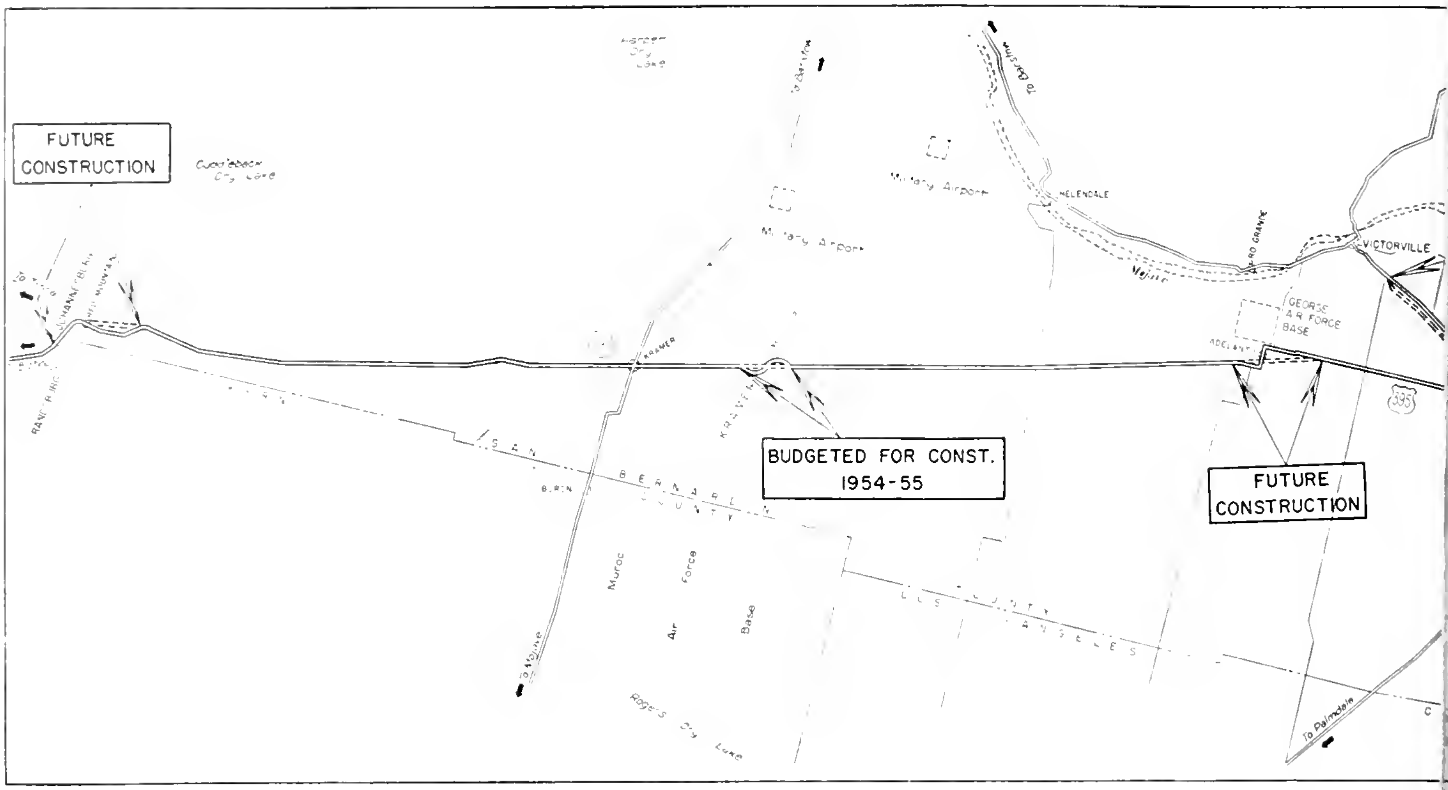
Perris was originally a mining town with millions of dollars' worth of gold produced in the Gavilan Hills just west of the city. Water was brought in from Bear Valley in the San Bernardino Mountains, but the town's Class "B" water rights proved inadequate and a decline set in until it was discovered that a large underground water reservoir existed. Today the valley is served by the Metropolitan Water District of Southern California, and a rich agricultural future appears assured. With the improved access provided by the modern highway facilities just completed, a continuing expansion of the valley's importance is expected.

East of the City of Perris, the bypass traverses the two-mile-wide flood plain of the San Jacinto River. Exhaustive preliminary studies revealed that crossing the area subject to flooding with a bridge would increase the cost beyond economic justification. The decision was made to bridge the main channel, and to provide several supplementary "equalizing" openings that would pass the estimated once-in-ten-years flood. The roadbed between bridges is designed as an overflow section functioning as a spillway weir.

Feeder Channel Constructed

In order to improve the flow to the bridges, a "feeder channel" 60 feet wide was constructed on the upstream side parallel to the highway. A similar distribution channel was excavated connecting all the bridges on the downstream side in order to improve

View of US 395 from Perris Boulevard Overcrossing looking north to D Street on-ramp



release of the flood water. Because of the eddying currents expected to occur in these channels, large quantities of riprap were placed to protect the roadway embankment from scour.

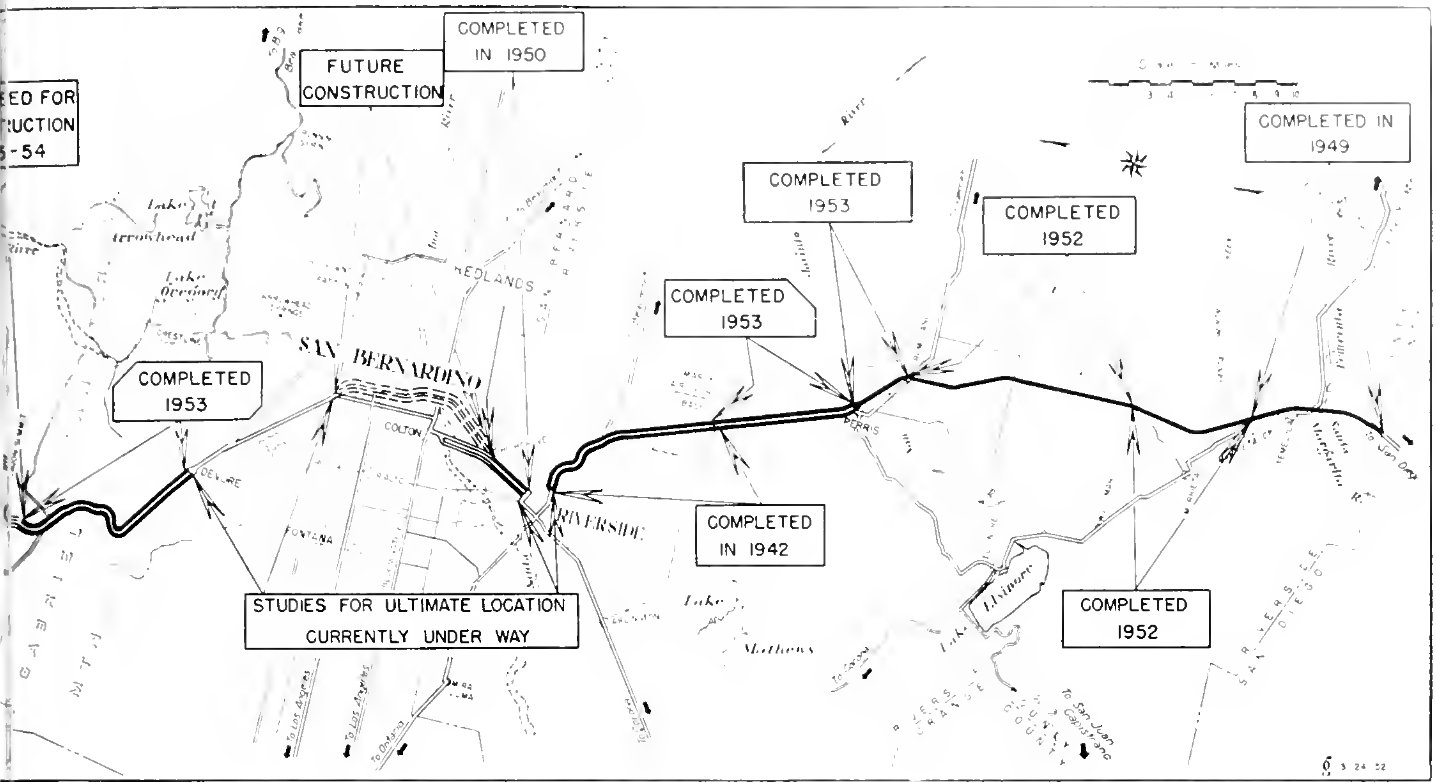
Some idea of the problem may be gained from conditions observed in this area in the memorable flood of February, 1927. The top of the nearby railroad tracks was under about a foot of water for a length of two miles. The entire flooded area was estimated at about 4,500 acres with an average depth of about three feet.

The new bridge across the main channel is 160 feet long. Three auxiliary 14-foot openings on each side of the main bridge were constructed about 100 feet apart, with the central span about 1,400 feet from the main channel. Eleven hundred feet on each side of the main channel, 28-foot bridges were constructed, making a total of nine bridges. In this manner, the depth of inundation will be nominal, and backwater created by the highway will be insignificant.

Five Contracts

The five contracts from the San Diego county line to March Air Force Base totaled $3,247,000 in construction cost, and have reduced the dis-

Intersection of US 395 with State Sign Route 74 to Hemet, looking north

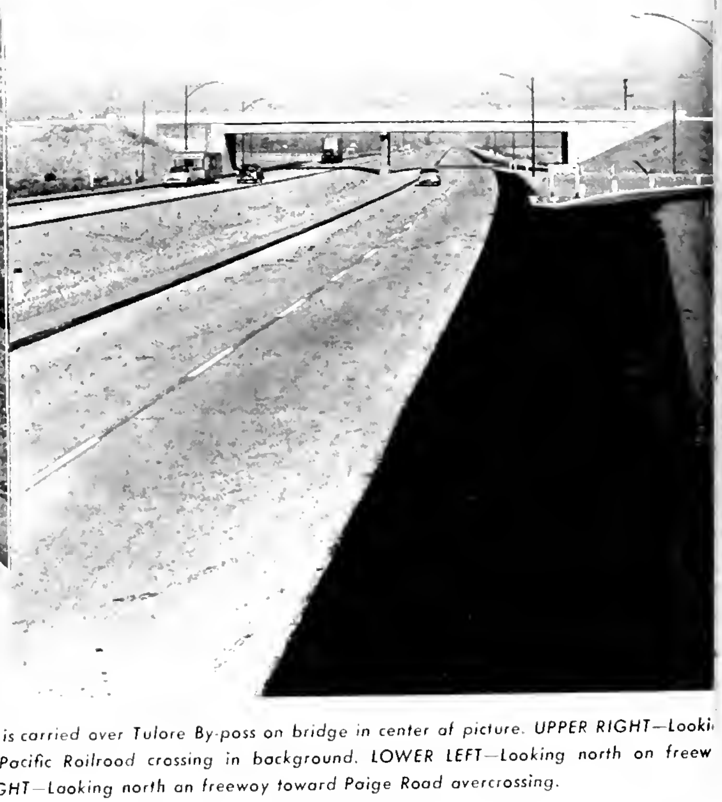


tance from Riverside to San Diego by 7.5 miles. Morrison-Knudsen, Inc., of San Francisco, built 5.9 miles from the county line to Temecula, with J. M. Hollister as resident engineer. L. A. & R. S. Crow of El Monte constructed 7.0 miles from Temecula to Antelope Road, with Warren Ford as resident engineer. The largest contract was the 10.5 miles from Antelope to State Sign Route 74 south of Perris constructed by the E. L. Yeager Company of Riverside. Paul Wittig was resident engineer on this contract. The same firm built the 4.7-mile Perris Bypass, with H. C. Prentice as resident engineer. The latest contract to be completed was the conversion of the old two-lane highway between Perris and March Air Force Base to a four-lane divided expressway. The contractor on this project was the Robert E. L. Parker Company of Claremont, who finished the 4.8 miles on December 31, 1953, at a cost of $407,000. Resident engineer again was H. C. Prentice.

Accident Pattern

In spite of the careful design providing ample sight distance in all directions at every intersection with modern channelization wherever the need was indicated by traffic volumes

Looking north at the transition from two lanes to four lanes divided. The four-lane divided highway is continuous from this point on the Perris Bypass into the City of Riverside.



UPPER LEFT Looking east on State Sign Route 63, the road to Lindsay, which is carried over Tulare By-pass on bridge in center of picture. UPPER RIGHT—Looki north on by-pass through bridge that carries SSR 63 over freeway. Southern Pacific Railroad crossing in background. LOWER LEFT—Looking north on freew from overcrossing at south end of Tulare By-pass. LOWER RIGHT—Looking north on freeway toward Paige Road overcrossing.

and movements, a serious accident pattern developed near Murrieta at Webster Road within six months of opening this section to traffic.

Doubling the usual number of advance warning and stop signs and the installation of oversize stop signs did nothing to reduce the accident toll, and traffic on Webster Road continued to ignore the required stop, occasionally with fatal results. Although sight distance at the stop sign was virtually unlimited, it was decided to grade the entire area down to pavement level to permit approaching cross traffic to see the actual pavement surface of the new highway for a considerable distance before making the stop. In addition, power was brought in from a line a quarter of a mile away, and an overhead flashing beacon was installed in time for the 1953 Fourth of July week end. Only two accidents have been reported since that date, and it seems assured that the corrective measures taken will continue to serve in making inattentive motorists aware of the fact that a major highway crosses the apparently harmless rural road.

Famous Vail Ranch

South of Webster Road, in the vicinity of Temecula, the highway traverses the great Vail Ranch, one of the largest agricultural operations in the United States. Four Spanish land grants, the Santa Rosa and Pauba Ranchos, and portions of the Temecula and Little Temecula Ranchos make up a domain of 90,000 acres. Although primarily a cattle ranch, large quantities of alfalfa, barley, potatoes, and row crops are grown, and several orchards dot the countryside.

The ranch has its own dam, a constant radius concrete arch structure across the Temecula River storing 50,000 acre-feet and furnishing a large proportion of the vast volumes of water sustaining the many operations required by 90,000 acres of diversified agriculture.

Ranch headquarters are in Old Temecula, where the adobe building in which the Treaty of Temecula was signed on January 5, 1852, is still in use. This treaty, between the United States and the San Luis Rey, Kahwea, and Cocomeahra Indians, permitted peaceful settlement of the area. The adobe building was a stop for Butterfield Stages and a station on the main military road between Los Angeles and Arizona during the Civil War.

Further Improvement Planned

With the coming of the California Southern Railway in the early eighties, Temecula moved to its present site on Murrieta Creek a few miles northwest of Old Temecula. Floods on the San Jacinto River in Railroad Canyon between Perris and Elsinore, and on the Santa Margarita River in Temecula Canyon washed out the tracks soon after being completed. They were rebuilt and washed out again, this time not to be replaced. Temecula, however, remained at its new location and has continued to prosper, especially since completion of the bypass in 1949 (see *California Highways and Public Works*, July-August, 1951).

Further improvement of the highway through the metropolitan area of Riverside and San Bernardino is contemplated as soon as funds can be made available therefor. The history of the West proves that better transportation invariably results in a wealthier and more stable economy. The improvement of US 395 and other main transportation arteries will again bear out past experience.

The $1,600,000 Port Industrial Waterway Bridge at Tacoma, Washington, has been opened to traffic. The 712-foot long bridge, which took nearly two years to build, has a lift-span to permit passage of ocean-going vessels.

Freeway Contract in Placerville Is Awarded

Director of Public Works Frank B. Durkee has awarded to Piombo Construction Co., San Francisco, a contract for $809,970 for the major grading and the construction of the remaining traffic and pedestrian bridges along the relocated route of US 50 through the City of Placerville in El Dorado County.

Durkee said that the proposed contract will take care of the major share of remaining construction work along the Placerville Freeway, leaving only a paving contract to be let after the grading is completed.

In addition to grading of the mile and a half of four-lane, divided highway through the city, the project will also include construction of a vehicular separation at Clay Street and pedestrian overcrossings at Coloma Street and Bedford Avenue.

Two New Bridges

Also included will be the construction of two new bridges on the freeway approaches across Hangtown Creek at Canal Street and Spring Street, and the widening of three existing bridges at Canal Street East, Coloma Street and Bedford Avenue.

Work on two bridges carrying the freeway over Locust and Washington Streets is already in progress under a separate contract awarded last February. Major work on the Locust Street bridge was finished and the structure thrown open to traffic last August so that it could be used by the fruit harvest traffic to and from the packing plants in the vicinity.

Total Cost $3,000,000

Total cost of the new freeway, which is expected to relieve traffic congestion through the city, will exceed $3,000,000. Included in this amount are construction, right of way, adjustment of railroad tracks and utility lines, and removal of buildings.

The freeway route starts at the west city limits, runs north of Hangtown Creek and the Southern Pacific railroad tracks until it rejoins the present highway near the highway patrol station on the east side of town.

The existing route follows along Main Street to the south of the creek and is subjected to extreme congestion, particularly during the summer months when traffic counts reach as high as 10,000 vehicles a day.

Clearing of the right of way for the new freeway involved some unusual operations, including the moving two years ago of the brick veneer Christian Science Church and the Placerville Women's Shakespeare Clubhouse.

Motels . . .

Continued from page 30 . . .

dicate the attitude of these motel owners with respect to the features of the access-controlled highways.

Entrances—The frontage road entrance directly in front of the motel is found to be much more popular than the entrance which was some distance from the motel. The principal reason for more people feeling this way is based upon the opinion that once a person drives by an entrance, he will not turn back. Considerable comment was made about the difficulty of motorists finding entrances into frontage roads after dark. There were no complaints on this matter where openings were illuminated. Several owners stated they felt reflector or illuminated signs would go a long way in correcting this difficulty. Entrances into motels along expressways were generally favorable.

Fences—There was a wide range of comments regarding the likes and dislikes of fences across the front of motel properties. The tabulation of the pros and cons showed the opinions about equally divided for and against a fence. Those liking it felt that it was helpful as a safety measure for protection of motel guests. Other comments in favor of the fence were that it kept out motorists who were not motel guests, and added to the attractiveness of the property. Adverse remarks regarding a fence were generally as follows: If all properties along the highway were fenced at one time, there would be no serious effect. The fence required considerable work to keep a clean appearance in front of the motel.

Frontage Roads—Motel owners located on frontage roads commented in varying degrees of likes and dislikes. The most prevalent remark made by those not liking the frontage road was that strangers had difficulty finding their way into a frontage road, particularly after dark. Many remarks were made that motorists are learning to like the frontage road when they learn its use. The remark was often made that motorists needed to be educated in the use of frontage roads, and the best solution would be some well-placed signs to direct traffic. The comments by those motel owners liking the frontage road were that it added to the attractiveness of the property; it offered opportunity for a one-stop development such as a group of retail outlets catering to motorists; made motel sites more desirable from the standpoint of safety; better opportunity to have attractive property along a new frontage road.

Signs—Nearly all motel owners on the access-controlled highways felt that better signs were needed to notify motorists of an approaching entrance, particularly in the case of frontage road openings. There were many comments that motorists liked frontage roads and would use them more if they were identified better through signs. There is a feeling among many motel owners that motorists are reluctant to turn back once they have passed an entrance. They are of the opinion that potential business is lost because of this, and they believe that adequate signs would increase their business.

From a review of the summary of comments given with respect to each feature of access-controlled highways where remarks were specifically invited, it is notable that the primary concern was having better signs so that motorists unfamiliar with the use of access-controlled highways could be educated through proper direction.

CONCLUSION

In making this study to determine from a factual standpoint the economic effect of access-controlled highways upon motels, we found there were a number of

PHOTO 4—Motel on frontage road in North Sacramento area. Frontage road entrances into through traffic lanes are 350 feet and 1,000 feet distant from motel.

very important factors, in addition to the type of highway, which had a profound influence on the success of a motel. This factual information shows that a weakness in one of these factors, for example, poor management, can be so detrimental to the success of a motel that it is singularly capable of eliminating the effectiveness of all other factors regardless of how favorable they might be.

The principal conclusions in the study:

1. The type of highway can influence the site of the motel, but the general area where the motel is located is not influenced by the highway. A motel in a location which does not supply potential customers does not have a fighting chance to succeed.

2. There is conclusive evidence that when the important factors influencing motel business are reasonably equal, the motels on access-controlled highways are capable of attaining even greater success than comparable motels on conventional highways.

3. The isolated motel does not have the opportunity for success that the same motel would have if situated in an area with other motels, despite the inherent competition in such a location.

4. New motels are going to continue to be built. Obsolescence of motels, lack of good hotel facilities, and a host of other reasons, in addition to the highway traveler, will continue to create demand and a need for newer and better motels. The construction of a new highway of freeway design along a new alignment will create some desirable business sites, even though these sites will not have any direct access into the through traffic lanes. When motels become interested in locating on these few sites, they will have to compete with other commercial and industrial enterprises. The few sites which result from the new alignment may be for sale, but at prices not economically sound for a motel investor.

There has been no indication that a group of financially sound and well-managed motels will be affected detrimentally by an access-controlled bypass. Some new motels will locate near the freeway if it is possible to find a reasonable site. Any growing industry, such as the motel business, will be continually attracting new investors. Those businesses which are established must maintain a high level of public service in order to compete with the constant change taking place.

The few sites created by the highway improvement do not accelerate this constant change to any appreciable degree beyond the normal expectancy in any healthy and active business enterprise.

State Wins Los Angeles Beautiful Awards

As described in the September-October, 1953, issue of *California Highways and Public Works*, nearly all planting of shrubs, trees and ground cover along California highways is for the control of erosion, fire and weeds and for traffic safety. Landscaping, in the sense of beautification for community appearance, is rare and is done only where there is general agreement on the desirability and need for the work.

Planting for functional purposes can be attractively done, of course. For example, the ivy and iceplant which were planted to help keep the soil in place on the slopes bordering the Arroyo Seco Parkway and sections of the Hollywood Freeway yield an extra dividend of natural beauty. Trees and shrubs enhance this effect, but are primarily planted to absorb noises and for traffic delineation.

Los Angeles Beautiful, an affiliate of the Los Angeles Chamber of Commerce, recently conducted a city-wide contest for outstanding planting projects. There were 12 classifications, including one for freeways and highways and one for public works buildings, with four prizes in each classification. The competition may become a yearly event on the basis of the widespread interest shown.

First place trophy awarded to Division of Highways. Other awards are of same design but smaller.

Awards to State

The first three prizes in the freeways and highways classification were awarded to state highway projects.

The section of the Hollywood Freeway between Grand Avenue and Glendale Boulevard, which includes the four-level distribution structure, won first place. Planting on this section is probably closer to landscaping of the beautification type than anywhere else on the State Highway System, and was designed in accordance with the desires of Los Angeles city authorities as well as in keeping with the importance of the four-level interchange as the nucleus of a metropolitan freeway system. It was planted in 1950 and 1951, and includes grass, ground cover, shrubs and trees.

Second prize went to the Arroyo Seco Parkway, planted between 1940 and 1948, and third to the section of the Hollywood Freeway between Glendale Boulevard and Western Avenue, planted in 1952 and 1953, both featuring the ivy and iceplant mentioned before.

The freeway planting was designed by H. Dana Bowers, Supervising Landscape Architect of the Division of Highways, and is maintained by District VII maintenance crews under the supervision of A. L. Olmsted, Highway Landscaping Supervisor.

In the public works buildings classification, fourth prize was awarded to the freeway maintenance office at 4170 Clinton Street, adjacent to the Hollywood Freeway in the vicinity of Vermont Avenue.

Golden State Freeway

By ROBERT H. BUTLER
Resident Engineer

Progress at Junction With Four Major Highway Routes

Highway engineers today, as did their predecessors the guides and explorers of yesteryear, still must seek mountain passes for economical and practical travel. Nature in her mountain blockading of over 5,000,000 inhabitants of the Los Angeles metropolitan area, reluctantly provided only a few passes, the principal one being the renowned Ridge Route, on US 99, now a part of the "Golden State Freeway."

Congregating at the southeasterly end of this pass are San Fernando Road, the most direct route to Los Angeles; Sepulveda Boulevard, serving the San Fernando Valley and beach communities; Foothill Boulevard following the foot of the Sierra Madre Mountains ot the San Gabriel Valley; and, as if this were not enough, the Sierra Highway going easterly to serve the fast growing, jet airplane building and testing area of Palmdale and Lancaster. All four of these arterials are state highway routes.

To combine, to intersect, to accelerate, and to decelerate these congregating major arterials for smooth and efficient traffic flow in spite of nature's seemingly cruel confinement, the highway engineers of District VII, together with the bridge engineers, were forced to search deep into their highway knowledge. Discarding first one alternative and then another, the final answer turned up the following:

The Problem

Move 1,750,000 yards of moterial with 29,000,000 station yards of overhaul;

Build seven bridges varying in span length from 27 feet to 457 feet;

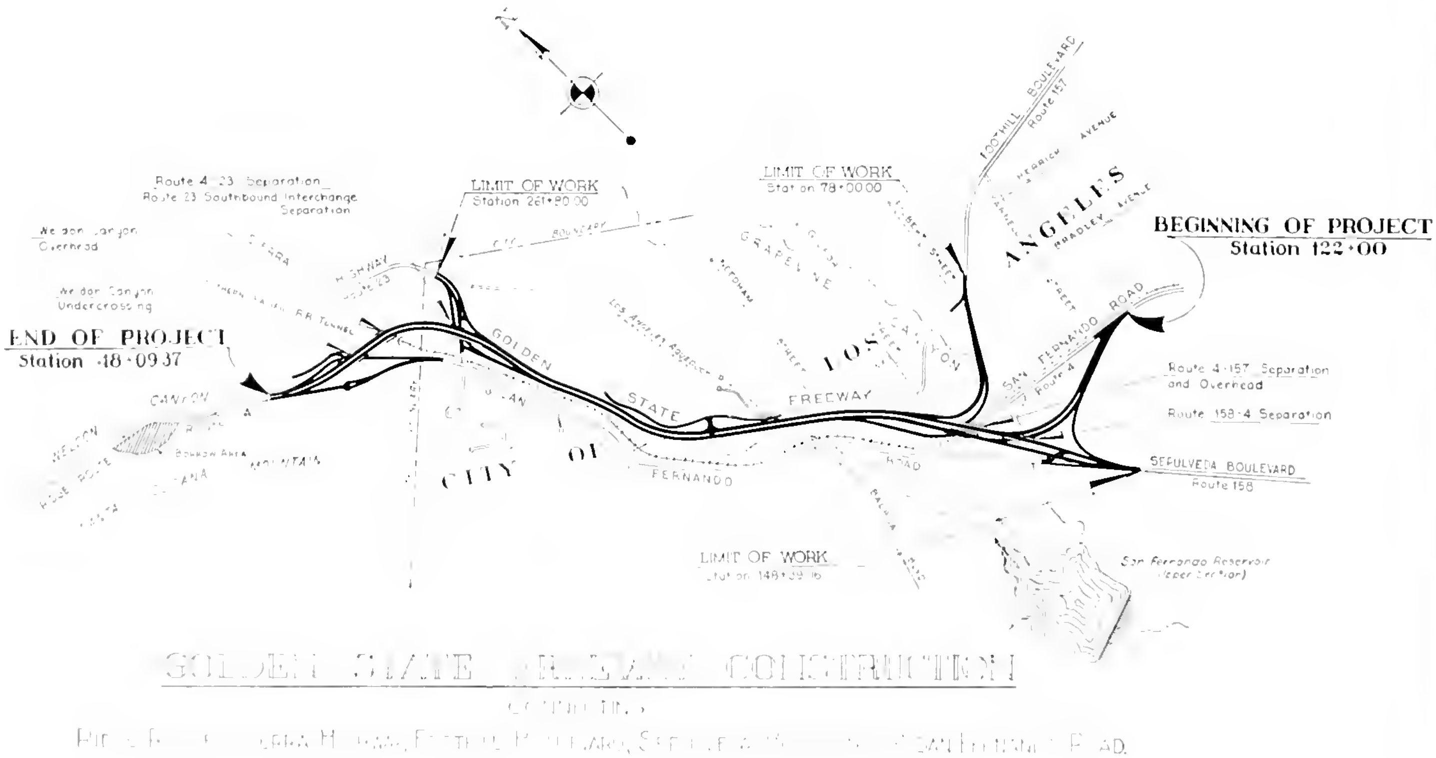
Ploce 16,000 feet of pipe vorying from 8 inches CMP's to 87 inches RCP, including a 14-foot metal plate arch;

Relocote a dozen utility lines, including pipe lines carrying one-third the totol natural gas supply of the Los Angeles metropolitan area;

Pave six miles of four-lane and six-lane roadway with Portland cement concrete or asphalt concrete within a three-mile project;

Perform various other work vorying from the instollation of property fencing to the construction of an equestrian undercrossing.

On July 16, 1953, Griffith Company of Los Angeles offered to perform this work on the Golden State Freeway for \$3,060,396.35—about \$407,000 less than the average of 13 other bidders. Griffith Company, after receiving the award of contract, started work on August 31, 1953. Since that



Looking northerly along completed Ridge Route section in Weldon Canyon, showing contractor's equipment descending 40 percent grade with embankment material for Weldon Canyon fill that is being obtained by widening the Weldon Canyon Summit cut

time, with the able assistance of their subcontractors, they are proving that with close coordination and careful planning, many phases of complex freeway construction may be performed simultaneously. To perform these various phases of work, equipment is now being used on the job which has a replacement value of over $1,000,000.

A million dollars of bridge work on the contract is under the direct supervision of C. J. Woodbridge, Bridge Department representative for the State Division of Highways. It is interesting to observe the variety of structural design included in this group of seven bridges. At the Route 158/4 separation and the Route 23 southbound interchange the large skew angle between abutments and deck called for "outrigger" construction so that girders could span the shortest distance between abutments. Route 4/157 separation and overhead has part of the structure founded on piles, with the concrete box girder spans joining steel girder spans over the Southern Pacific Railroad.

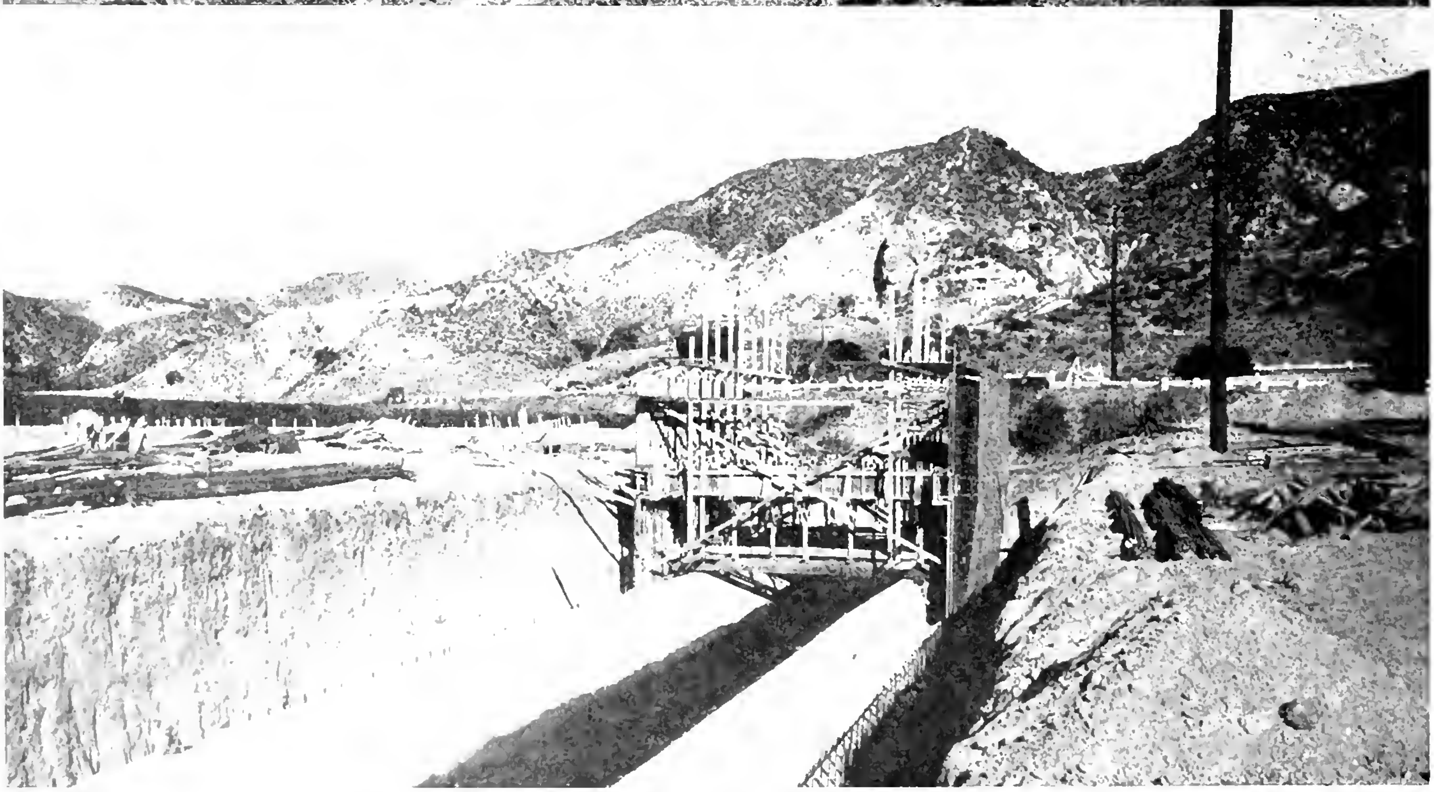
Weldon Canyon Overhead

Representing a rather unusual use of a bridge is the Weldon Canyon overhead which crosses the Southern Pacific Railroad Tunnel No. 25 with four spans. To avoid placing additional loads on the tunnel, bents adjacent to the tunnel transmit their loads through cast-in-place piles drilled to 10 feet below the railroad track. Some of the piles are 80 feet deep, and were drilled through layers varying from soft silt to hard rock. While drilled piles were required for this bridge and the Owens Valley-Los Angeles Acqueduct Bridge, it is interesting to note that the contractor elected to use drilled piles for the entire project.

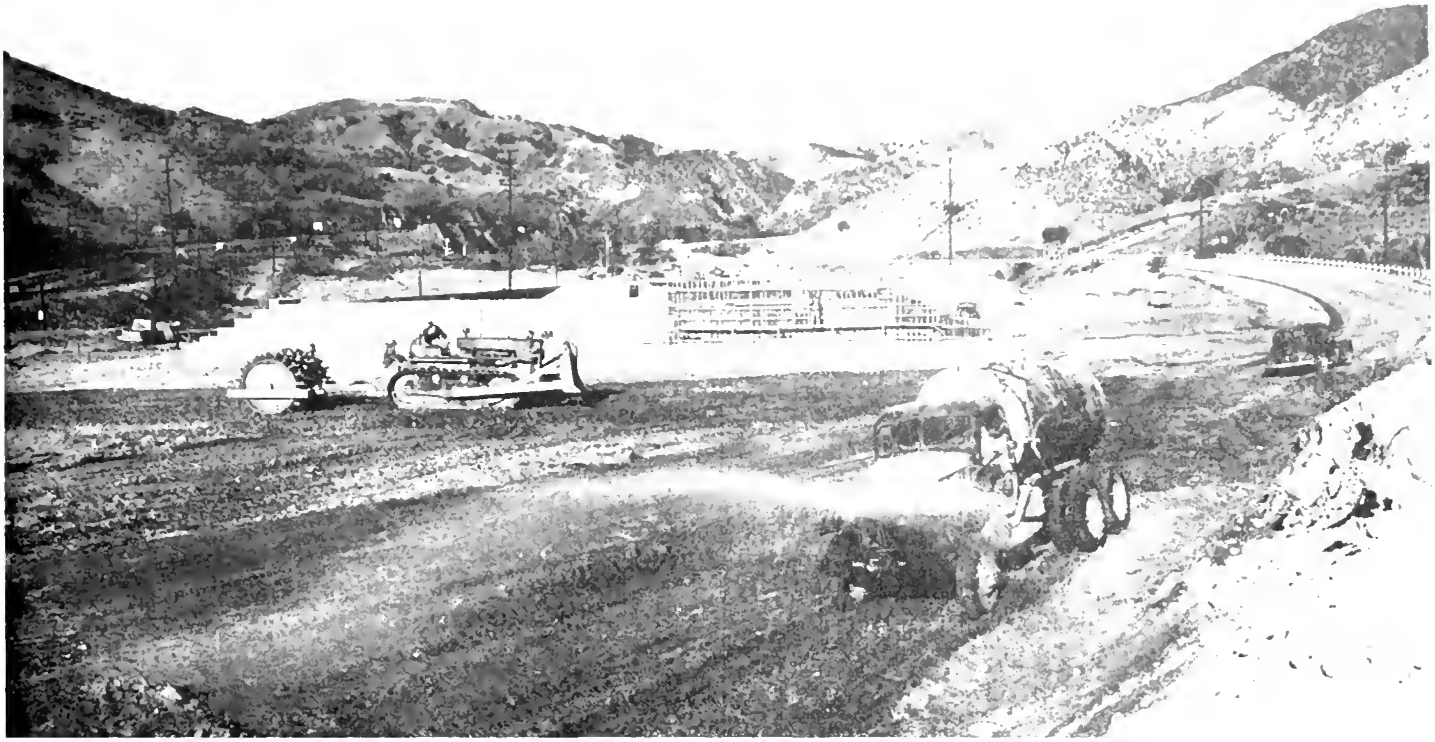
To the passing motorist the earthwork, which has been sublet to J. Tomei and Sons, is most spectacular. One unidentified lady motorist, after seeing a pioneer "cat" perched some 250 feet in the air with apparently nothing holding up the outside track, stepped from her car, pointed upward, let out a scream and promptly fainted. In the heaviest cuts approximately 75,000 cubic yards per 100 feet station will be moved.

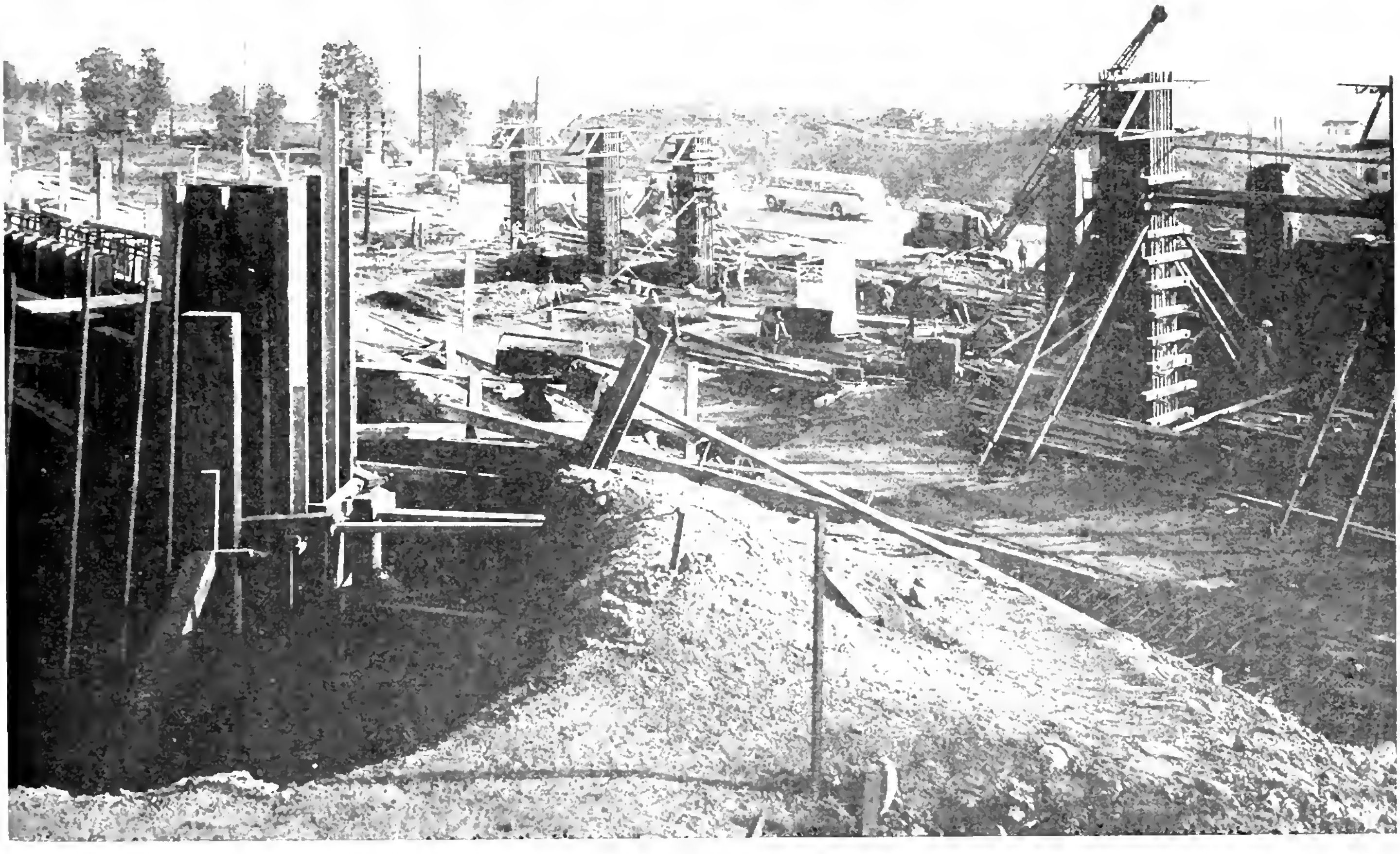
Perhaps this business of altering nature to serve man is more realistic to Victor Weldon, a native son born in 1890, than to many of us, at least in a nostalgic sense. In the span of his lifetime he has seen Weldon Canyon, which was named after his father, ravaged by fire and torn by floods, yet still remain a canyon, finally to lose its identity as such because of the growing traffic demand for better highways.

Hal McGregor is job superintendent for Griffith Company, and the writer, resident engineer for the State Division of Highways. Joe Porcher is general superintendent for Griffith Company, and F. A. (Ace) Parker, field supervisor for the State.



UPPER Looking southeasterly, showing portion of half-million-yard fill under construction in Weldon Canyon. LOWER Looking northeasterly along Owens Valley-Los Angeles open channel aqueduct, showing special design, reinforced concrete bridge construction to permit passing of freeway over the aqueduct.





UPPER—Looking northerly along Golden State Freeway approaching the Owens Valley-Los Angeles aqueduct crossing, showing fill-compacting operations under way. The structure shown in center of photograph is the reinforced concrete equestrian undercrossing. LOWER—Looking southerly at bridge bents under construction for the Route 4 157 separation structure which will carry the Golden State Freeway over San Fernando Road, the main link of the Southern Pacific Railroad, and the southbound interchange roadway to Foothill Boulevard.

CALIFORNIA'S ACCELERATED HIGHWAY CONSTRUCTION PROGRAM

By FRANK B. DURKEE, Director of Public Works

The California Highway Commission in November, 1953, adopted the largest annual highway budget in the history of California—so far as we know, the largest in the history of any state in the Union, exclusive of toll facilities.

This budget totals $298,998,830. After making deductions for city streets and other purposes, it provides a total of approximately $267,000,000 for all state highway functions. Of this amount, $205,000,000 is allocated for major state highway construction purposes, including right of way acquisition. This is 74 percent more for major construction than was provided for this purpose in the budget adopted in October, 1952.

Deficiencies Always With Us

Whether we go back to the days of forty-nine, to the horse and buggy days of the nineties, or the first bond roads of 1912, California has had a great burden of highway deficiencies. This has continued to the present day. We have seen the Highway Commission, year by year, especially since World War II, take the one step forward which available funds permitted, while mounting traffic left us two steps behind.

This year, at long last, the tide may be said to have turned. It has been possible, with the increased revenues provided by the Highway Act of 1953, to take a real step forward.

During the 1953 Session of the Legislature, in response to questions by legislative committees, representatives of the Department of Public Works expressed the opinion that it would be possible to break the backbone of California's critical highway problem in 10 years, if adequate financing were provided.

New Taxes Made Possible Increase in Current Budget

The Legislature's response was a sizable increase in highway user taxes, which became effective, in part, on July 1st, last. Largely as a result, the commission was able to revise the previously adopted budget for the current fiscal year (1953-54), and to add to it more than $87,000,000 for construction and rights of way. Last November the second budget (1954-55) adopted on the basis of the new legislation set the all-time record for highway financing in California.

In view of the fact that the present law provides for a cutback of one-half cent in the gasoline tax and in other taxes at the end of two years, it may well be some years before our state highway construction program will again equal this new record. Some time will necessarily elapse before even our increasing traffic and travel will produce sufficient additional income to provide another $205,000,000 in one year for major construction purposes.

Features of the 1954-55 Budget

Let us consider some of the important features of the new budget as it pertains to state highways.

This $267,000,000 is a lot of money. Most of it comes from highway user taxes, and the highway user is entitled to know what he may expect for his money in terms of safer and more expeditious travel.

The largest single category in the 1954-55 State Highway Budget is for major construction and improvement, $145,387,000 (which does not include rights of way). This represents 55 percent of the total for all state highway purposes. The next largest, rights of way (which is principally to provide for *future* major construction and improvement), is approximately $60,000,000, or 22 percent.

A part of the remaining 23 percent eventually will go into additional mileage of new and improved highways. There is a small item for minor improvement and betterment, and a substantial one of nearly $5,000,000 as a contingency reserve most of which may be expected to be transferred by the end of the fiscal year to construction projects.

Maintenance continues to require approximately $25,000,000; administration amounts to $6,500,000; and there are the usual provisions for buildings, plants, equipment, and the maintenance of the San Francisco-Oakland Bay Bridge. The only other major category of expenditure is $16,000,000 for preliminary engineering—which, like acquisition of rights of way, is essential for the planning of future construction.

An item of $2,500,000 for federal aid secondary matching funds has been included in the new budget, and a like amount was included in the 1953-54 budget as revised last July.

This new feature of the state highway budget is a provision of the 1953 legislation, which has as its purpose assistance to the counties in matching the federal aid secondary funds allocated to them. The new law now provides that from the State Highway Fund there shall be provided the necessary matching funds as required by federal law, not to exceed $50,000 for any one county. Thirteen counties already have availed themselves of this assistance, and others are planning to do so before the end of the current fiscal year.

What the New Budget Is Expected to Accomplish

The highway user probably is less concerned with budget details than he is with the mileage of new, modern highways that the dollars represent.

During the 1953 Session of the Legislature considerable was said about priority of highway needs. In answer to legislators' questions, representatives of the department and of the commission gave assurance that any additional funds that might be provided would be used to attack the most critical situations first, and that the job of progressively meeting the State's huge backlog of highway deficiencies would go forward in an orderly manner and as rapidly as possible, subject, of course, to the allocation formulas of the Legislature.

A study of the two budgets adopted since the new legislation took effect will demonstrate that this promise has been kept. Already there has been a tremendous state-wide advance in the construction of essential urban freeways, intercity expressways, and a large mileage of rural routes; and the progress next year will certainly be even more impressive.

Los Angeles Freeways

In the Los Angeles area, among other projects, the Hollywood-Santa Ana Freeway connection will be completed, providing more than 43 miles of multilane full freeway continuous from Vineland Avenue in the San Fernando Valley to southeast of the City of Tustin except for the portions through Anaheim and Buena Park. The Ramona Freeway will be extended through and easterly of El Monte; the Harbor Freeway, currently in the construction stage as far south as Santa Barbara Avenue, will start reaching northward from San Pedro; the Colorado Freeway will be extended westward from the new Pioneer Bridge in Pasadena; and a start will be made on the Sepulveda Freeway.

In San Francisco

In the San Francisco Bay area, we shall see under way the direct connection between the Bayshore Freeway in San Francisco and the Bay Bridge; the completion of the widened East Shore Freeway north from an enlarged distribution structure to El Cerrito; a new freeway connection from the East Shore Freeway to the Dublin Canyon Freeway section of US 50; freeway development in downtown Oakland; and a real start on the new freeway section of US 40 in western Contra Costa County, extending from Richmond northerly toward the Carquinez Bridge.

Freeway by-passes of the congested business districts of Fresno, Salinas, Arcata, Banning, Petaluma and other cities will be initiated or continued in the new budget. San Diego will see the start of a new east-west freeway on Sign Route 94.

On US 99

On the major intercity route, progress is no less impressive. By the time all the funds allocated to US 99 in the current budget (1953-54) and the new budget (1954-55) have been expended, there will be a very limited mileage of that route between Los Angeles and Sacramento remaining to be improved to multilane divided highway standards. The expressway construction of US 101 between Los Angeles and San Francisco is going ahead at a rapid pace; and 101 north of San Francisco—the Redwood Highway—is losing more and more of its curves, grades and congestion. More multilane divided miles are being added on US 40; US 50; on US 60-70-99 in Riverside County; and on portions of US 99 north of Sacramento.

Although a large portion of the budget is devoted to freeway construction, many miles of other important improvements are included. Allocations to long-waited and necessary state highway projects have been made in every county in the State in the new budget or the current budget. These projects represent the most critical deficiencies in their respective regions.

The Continuing Highway Program

Thus we have a budget which represents not only a considerable step forward toward the goal of adequate highways in our State, but which is also a *planned* step forward. Projects which have been at or near the top of the critical list for years have now been advanced to the construction stage. Hundreds of miles of safer, less congested highways will be available for our people far sooner than previously scheduled.

Another important fact about the new budget is that it does not represent a single, spasmodic outburst of highway construction activity. It is part of a continuing program which has been under way since shortly after World War II, with the difference that it is now being carried on at an accelerated rate.

Still another important fact about the budget is that the highway improvements for which it provides are, for the most part, *permanent* improvements. The freeway principle—control of access, with little or no cross traffic—is being adhered to on as many new projects as possible. If the traffic needs of California are to be met, and if the public investment in our highways is to be protected and preserved, we must continue to concentrate, wherever possible, on permanent improvements and on highways of the limited access type; otherwise we shall risk dissipating our highway user taxes on projects which will not yield long-term benefits to our people.

Mony Projects Yet Unfinished

But, despite all that may be said about our augmented program, we are still deep in the woods. We still have with us, for example, many, many miles of unbuilt freeways in the Los Angeles area; the much-needed addition to the Posey Tube between Oakland and Alameda; the freeway in the Walnut Creek area in Contra Costa County; long substandard stretches of the Redwood Highway; hundreds of inadequate bridges, including a multimillion-dollar additional bridge across Carquinez Straits. This progress report on your state highway program would be out of balance if it failed to take cognizance of how far we have yet to go.

Augmented Program Being Administered

The immediate task of the Division of Highways, however, has been to put the additional funds to work as quickly as possible. At the time the 1953 legislation was under consideration there were questions in some quarters as to the ability of the division and the contracting industry to make full use of the augmented revenues as they would become available. These questions, I believe, have now been pretty definitely answered.

By the end of 1953, with six months to go, the Division of Highways had under construction 277 individual contracts having a value of $154,000,-000. This leaves a balance of $23,000,-000 yet to be contracted against the 1953-54 budget, to be awarded early this spring. Plans and specifications are complete for many projects included in the 1954-55 budget which was adopted by the commission last

November. Some of these projects will be advertised in January and February of this year, so that many contracts will be ready for award on April 1st, as the code permits. Construction should be well under way by this summer.

The State's engineering organization is demonstrating its ability to design and administer the expanded highway program. And the number of bids we are receiving indicates, among other things, that the contracting industry is presently capable of absorbing and handling the increased construction the new funds have made possible. This will be true, I believe, should the present level of taxes be continued, which, of course, is a policy question to be resolved by the Legislature.

Continuous Planning

The value of continous planning far ahead of immediately available funds was never more clearly demonstrated than by the prompt and effective expenditure now being made of the new highway revenues. Because the Division of Highways was ready with the plans, it was possible for the Highway Commission to adopt an increased and revised budget for the current year within three weeks from the effective date of the legislation. Because the division had completed preliminary studies and was well along on detail design and plans for additional projects, the budget for 1954-55 will be translated into contracts and construction without delay. Further advance planning and preliminary engineering work are being continued and accelerated.

Revolving Fund for Right of Way Important

The revolving funds which the Legislature made available for acquisition of right of way, also has been of great importance in the speedup of the highway program, and in the cutting down of future costs. Some $20,000,000 has been made available to date, and another $10,000,000 can be used starting July 1, 1954.

Up to the present, the Highway Commission has authorized the expenditure of $12,000,000 of the advance right-of-way funds, principally for the acquisition of property on which improvements were being planned. It is estimated that if this $12,000,000 had not been available, and the purchase of the properties had had to be deferred until after the contemplated improvements had taken place, $80,000,000 would have been required to acquire them for state highway purposes. In other words, based on a conservative appraisal of values following anticipated development of properties already acquired, in the process of acquisition, there is a net indicated saving to the State thus far, through the use of this right-of-way revolving fund, of $68,000,000 in right-of-way costs.

It now appears that it will be possible to continue advance right-of-way acquisition, and that the remaining $10,000,000 will be drawn on as soon as it becomes available next July. Applying the current rate of savings to the entire $30,000,000 of revolving funds, a saving of $170,000,000 may reasonably be expected.

Finally since some portion of the money will be returned to the fund before all of it is expended, and will, in turn, be used to purchase still more advance right of way, further savings undoubtedly will develop. By 1962, when the fund terminates under present law, we may very well have saved as much as $200,000,000 by acquiring rights of way before property development takes place. It is believed the fund is adequate for the present.

Cooperation With Owners Now Possible

Another important result of the program for advance acquisition of right of way is the immediate and effective cooperation it makes possible between the department and landowners and developers. In areas where future highway construction is under consideration, owners are now enabled to develop their properties knowing how future highway construction is going to affect their property, while the taxpayers save money in the actual costs of land for highways.

Land developers are appreciative of the fact that the State can now back up its long-range highway planning with definite action, and, in turn, they are inclined to pay more attention to future highway needs, and to offer more assistance to highway planners.

Route Adoptions Control Program

But the effectiveness of the advance right-of-way program, like all highway planning, is dependent on a firm and sustained policy of route determination. If we are going to correct our highway deficiencies in any reasonable period of time, and at the least possible cost to the highway user, the State must proceed with a program of route adoptions so that precise plans may be prepared, right of way acquired, and construction undertaken. Therefore, the progress of route adoption proceedings may well control the progress of our augmented highway program.

Present day standards and needs make it inevitable that, to improve almost any California state highway, some private property must be acquired. Despite the careful study that goes into every project, there is bound to be some degree of individual opposition to whatever route is recommended by the State Highway Engineer. The commission stands ready, as always, to give all possible consideration to the expressed desires of a community. But we cannot permit, if we are to serve the general public interest, the bogging down of the continuous, orderly development of an adequate highway system for the 12,000,000 people and the 6,000,000 motor vehicles in California in a flood of individual objections to specific freeway routes.

Transportation has always been the key to development in America. And in this regard highways are vital to the future of California. We must ever be conscious of what the extension and improvement of the highway system is doing to the economy of our State as a whole, and of local areas in particular. Even if the statutes did not so require, it would be the policy of the commission, I am sure, so far as possible to support an equitable and balanced state-wide program. The need for such a balanced program is one of the reasons why route adoptions are so important; why unreasonable delay, for whatever reason, may result in actual loss of business or other detriment to given areas of our State.

Support of Civic Groups Appreciated

In this connection I should like to express the gratitude of the commission for the stand which has been taken by civic organizations in recent route adoption discussions. Such bodies, along with planning commissions and other public-spirited groups, have taken the trouble to inform themselves of the facts—all the facts—involved in the selection of a recommended route, and often have endorsed the proposal of the State Highway Engineer in the face of severe criticism by individual citizens or by newly formed protest organizations.

Such support makes it less difficult for the commission and the engineers to continue planning those freeways which are a recognized, urgent need of motor vehicle users and communities throughout California.

Highway Program Cannot Wait

Transportation I have suggested, is the key to our advancement. Often, in the course of freeway discussions, the question arises: Are freeways and other modern highway improvements the answer, or a complete answer, to our transportation problem?

Certainly there can be little question but that the over-all transportation needs of California will require more than freeways. There is need, in our metropolitan areas particularly, for some form of mass transportation and for what has come to be called rapid transit. We can all agree that any such development should be coordinated with the highway program. But for the present such proposals are largely in the discussion stage. How soon any attainable plan can be agreed upon and implemented, is anybody's guess.

In the meantime, nearly 6,000,000 motor vehicles have been registered in California. The need to provide the highway facilities which they require is our immediate, pressing transportation headache. This is the job of the Division of Highways, and it is a job which cannot wait. The freeway program, with its increased traffic capacity and increased safety, is our answer.

Public Has Accepted Increased Highway Taxes

I have mentioned the gratification of the Highway Commission at being provided the means to accelerate our highway program. There is another source of gratification in this situation. That is the general public acceptance of the increased highway user taxes which have made the accelerated program possible.

The Associated Press stated in a recent feature article that, "every time you drive into a service station and say 'fill 'er up!' you are buying a piece of highway."

I believe the general acceptance of the increased taxes is due to public confidence, built up over many years, that our "pay as you go" program is sound, and that the highway user funds are being properly and effectively expended in the improvement and operation of our highway system. I believe, also, that it is attributable in large measure to public awareness of the need for the increased revenues. For this public awareness a great deal of credit is due to many individuals, publications and organizations for a sustained program of public information concerning the highway needs of our State.

Robert E. McClure Succeeds H. R. Baker

The California Highway Commission has a new member in the person of Robert E. McClure. He was appointed by Governor Goodwin J. Knight on January 15th to serve on the Highway Commission for four years succeeding Harrison R. Baker of Pasadena who served four terms.

ROBERT E. McCLURE

He was born at Columbus, Ohio, in 1896 but has been a resident of Southern California since 1922. He is the editor and publisher (with J. D. Funk) of the Santa Monica *Evening Outlook* and has become widely known in Southern California for his outstanding editorial writing for his newspaper. He is also the author of five published novels and numerous short stories and articles.

Always active in civic affairs McClure has been Chairman of the Highway Committee of the Santa Monica-Ocean Park Chamber of Commerce for the past three and one-half years. He was the leader in the campaign for a charter change in the City of Santa Monica that led to the adoption of the council and city manager form of government for that city.

He has been a long time director of the local Community Chest, Red Cross, Boy's Club, Chamber of Commerce and other civic organizations. McClure is also president of the Santa Monica Bay Council of the Navy League.

A graduate of Yale University he earned his Phi Beta Kappa key there as well as belonging to Zeta Psi. He was a resident of Pasadena from 1922 to 1936 and new lives in West Los Angeles. He is married and has four children. His father was Colonel Samuel G. McClure (1863-1948), who published newspapers in Ohio and Southern California and was one of the original members of the Metropolitan Water Board of Southern California.

YIELDING RIGHT OF WAY

The first vehicle entering an intersection has the right of way, says the California State Automobile Association. The vehicle on the left yields right of way if two or more vehicles enter intersection simultaneously. Drivers must yield right of way to pedestrians in marked or unmarked crosswalks.

Cost Index

Shows Little Change in Highway Costs During Fourth Quarter of 1953

RICHARD H. WILSON, Assistant State Highway Engineer
H .C. McCARTY, Office Engineer
JOHN D. GALLAGHER, Assistant Office Engineer

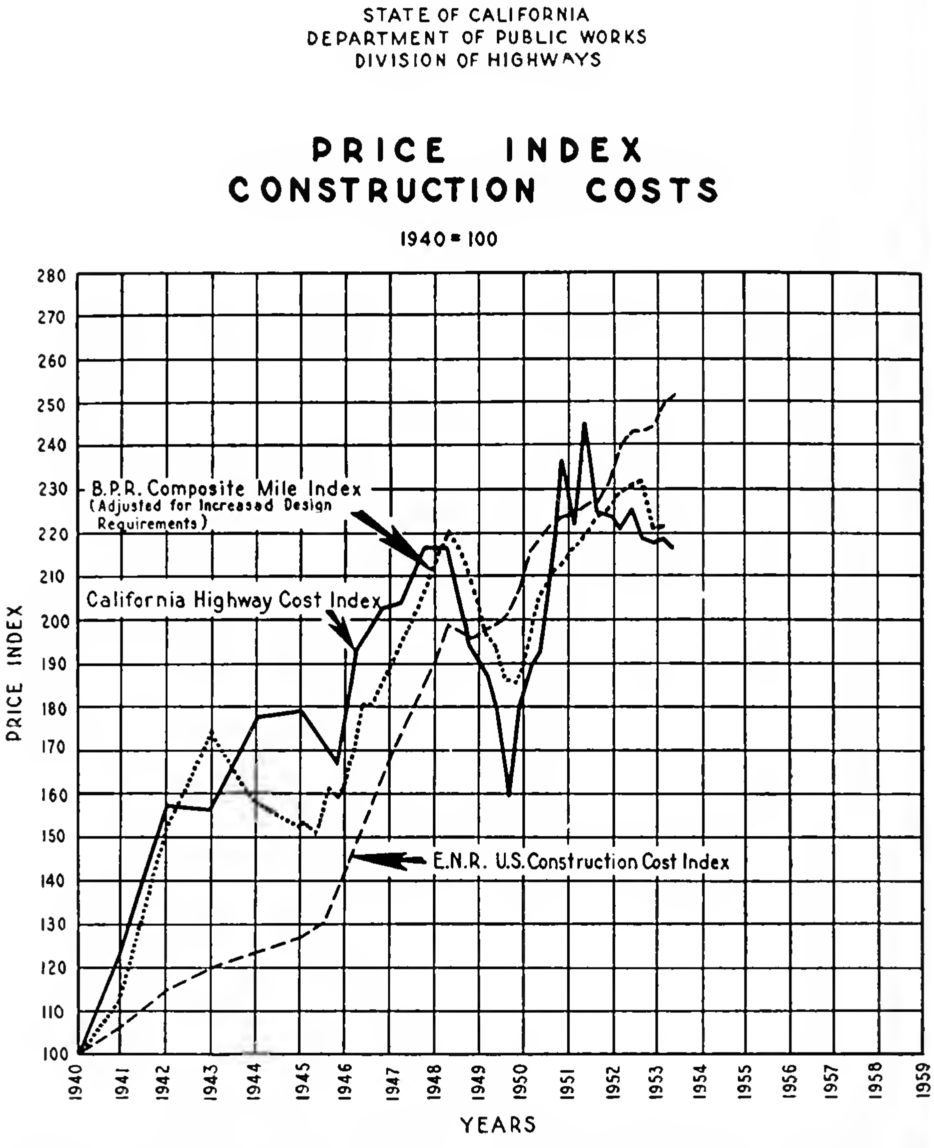
The California Highway Construction Cost Index dropped six-tenths of 1 percent during the fourth quarter of 1953. During the year of 1953 the Index had a maximum spread of only 1.6 points.

The Index stood at 216.7 (1940 = 100) for fourth quarter as compared to 218.0 in the third quarter, 217.5 in the second quarter and 218.3 in the first quarter of 1953 and 226.2 in the fourth quarter of 1952. The fourth quarter of 1953 index figure of 216.7 is 28.7 index points, or 11.7 percent, under the 245.4 of the fourth quarter of 1951 which was the quarter of highest construction costs as reflected by the Index.

The California Highway Construction Cost Index is tabulated below by years and quarters since 1940.

Year	Cost index
1940	100.0
1941	125.0
1942	157.5
1943	156.4
1944	177.8
1945	179.5
1946	179.7
1947	203.3
1948	216.6
1949	190.7
1950 (1st quarter)	160.0
1950 (2d quarter)	180.0
1950 (3d quarter)	189.2
1950 (4th quarter)	194.8
1951 (1st quarter)	215.4
1951 (2d quarter)	238.3
1951 (3d quarter)	221.9
1951 (4th quarter)	245.4
1952 (1st quarter)	224.8
1952 (2d quarter)	224.4
1952 (3d quarter)	221.2
1952 (4th quarter)	226.2
1953 (1st quarter)	218.3
1953 (2d quarter)	217.5
1953 (3d quarter)	218.0
1953 (4th quarter)	216.7

The small spread of the Index through the four quarters of 1953 would indicate a nearly stationary condition during the year. In the overall this is true, but individual construction items show more fluctuation than the Index would indicate as may be noted in the accompanying tabulation of Average Contract Prices.



While the Index lowered 0.6 percent during the fourth quarter, this drop was effected by decreases of 11.1, 1.9, 12.5 and 7.3 percent declines respectively in the average unit prices of roadway excavation, untreated rock base, plant-mixed surfacing and asphalt concrete, and in the face of rises of 7.2, 8.5, 14.1 and 7.8 percent in the unit prices of portland cement concrete pavement, structure concrete, bar reinforcing steel and structural steel, respectively.

It would appear that those items of concrete and steel which showed increases are the ones which are more

CALIFORNIA DIVISION OF HIGHWAYS AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Crusher run base, per ton	Plant-mix surfacing, per ton	Asphalt concrete pavement, per ton	PCC pavement, per cu. yd.	PCC structures, per cu. yd.	Bar reinforcing steel, per lb.	Structural steel, per lb.
1940	$0.22	$1.54	$2.19	$2.97	$7.68	$18.33	$0.040	$0.083
1941	0.26	2.31	2.84	3.18	7.54	23.31	0.053	0.107
1942	0.35	2.81	4.02	4.16	9.62	29.48	0.073	0.103
1943	0.42	2.26	3.71	4.76	11.48	31.76	0.059	0.080
1944	0.50	2.45	4.10	4.50	10.46	31.99	0.054	0.132
1945	0.51	2.42	4.20	4.88	10.90	37.20	0.059	0.102
1946	0.41	2.45	4.00	4.68	9.48	37.38	0.060	0.099
1947	0.46	2.42	4.32	5.38	12.38	48.44	0.080	0.138
1948	0.55	2.43	4.30	5.38	13.04	49.86	0.092	0.126
1949	0.49	2.67	4.67	4.64	12.28	48.67	0.096	0.117
1st quarter 1950	0.34	2.22	3.65	3.74		40.15	0.077	0.081
2d quarter 1950	0.40	2.13	4.48	3.74	10.86	43.03	0.080	0.105
3d quarter 1950	0.41	2.32	4.25	5.50	10.91	44.34	0.093	0.131
4th quarter 1950	0.42	2.81	4.64	4.61	12.55	43.18	0.098	0.120
1st quarter 1951	0.45	3.07	4.06	5.22	11.71	46.38	0.103	0.206
2d quarter 1951	0.63	3.88	4.56	4.63	12.93	51.50	0.105	0.166
3d quarter 1951	0.56	2.88	4.59	3.90	12.41	46.14	0.107	0.165
4th quarter 1951	0.66	2.91	5.66	4.89	12.71	49.38	0.105	0.169
1st quarter 1952	0.56	3.25	4.88	4.77	14.25	47.46	0.094	0.152
2d quarter 1952	0.53	3.19	5.29	4.13	14.20	49.12	0.091	0.143
3d quarter 1952	0.55	2.61	5.49	4.60	12.80	48.21	0.094	0.132
4th quarter 1952	0.66	2.68	4.97		12.53	48.45	0.094	0.128
1st quarter 1953	0.45	2.48*	5.27	4.46	12.47	53.19	0.098	0.150
2d quarter 1953	0.50	2.07	5.38	4.59	13.06	52.68	0.091	0.132
3d quarter 1953	0.54	2.15	5.30	4.82	13.78	49.23	0.092	0.129
4th quarter 1953	0.48	2.11	4.74	4.47	14.77	53.41	0.105	0.139

* Untreated rock base substituted for crusher run base at this point.

sensitive to labor costs, while roadway excavation, rock and plant-mixed surfacing in which labor is a lesser factor than machinery decreased.

However, it is still the opinion of this department that the predominating factor at this time in holding overall construction costs to a level and preventing increases is strong competition among bidders. Reference to the accompanying tabulation of the average number of bidders on work of the Division of Highways for the last six months of 1953 shows an increase from 6.2 in July to 7.7 in December, with the larger jobs consistently attracting more contractors. It will be noted that during this six months' period that the average number of bidders on 135 projects costing up to $50,000 was 5.3 while on 15 projects of from $500,000 to $1,000,000 the average number of bidders was 9.5 and on 13 projects of over $1,000,000 each the average was 10.5 bidders.

Comparison of California Highway Construction Cost Index with the Bu-

. . . Continued on page 50

CALIFORNIA DIVISION OF HIGHWAYS NUMBER AND SIZE OF PROJECTS, TOTAL BID VALUES AND AVERAGE NUMBER OF BIDDERS (July 1, 1953, to December 31, 1953)

Project volume	Up to $50,000	$50,000 to $100,000	$100,000 to $250,000	$250,000 to $500,000	$500,000 to $1,000,000	Over $1,000,000	All projects
Road projects:							
No. of projects	114	32	28	21	12	3	203
Total value (bid items)	$2,227,504	$2,176,383	$4,523,023	$7,109,040	$7,408,849	$3,665,369	$27,110,168
Avg. no. bidders	4.9	7.1	7.5	8.7	9.6	9.7	5.6
Structure projects:							
No. of projects	21	8	7	6	3	3	48
Total value (bid items)	$562,494	$536,741	$1,025,106	$2,353,865	$2,098,591	$6,053,917	$12,630,714
Avg. no. bidders	7.4	9.6	10.3	10.0	9.0	12.7	8.9
Combination projects:							
No. of projects						7	7
Total value (bid items)						$16,908,600	$16,908,600
Avg. no. bidders						10.0	10.0
Summary:							
No. of projects	135	40	35	27	15	13	258
Total value (bid items)	$2,789,998	$2,713,124	$5,548,129	$9,462,905	$9,507,440	$26,627,886	$56,649,482
Avg. no. bidders	5.3	7.6	8.1	9.0	9.5	10.5	6.9

Total Average Bidders by Months

July	Aug.	Sept.	Oct.	Nov.	Dec.
6.2	6.9	6.4	7.6	7.4	7.7

California Bridges

Downtrend of Construction Costs Halted During 1953

By J. S. McCLELLAND, Assistant Statistician, and
W. J. YUSAVAGE, Junior Research Technician, Bridge Department

The following article is the second in a series dealing with California bridge costs. The preceding article, which appeared in the January-February, 1953, issue of *California Highways and Public Works,* provides a general introduction.

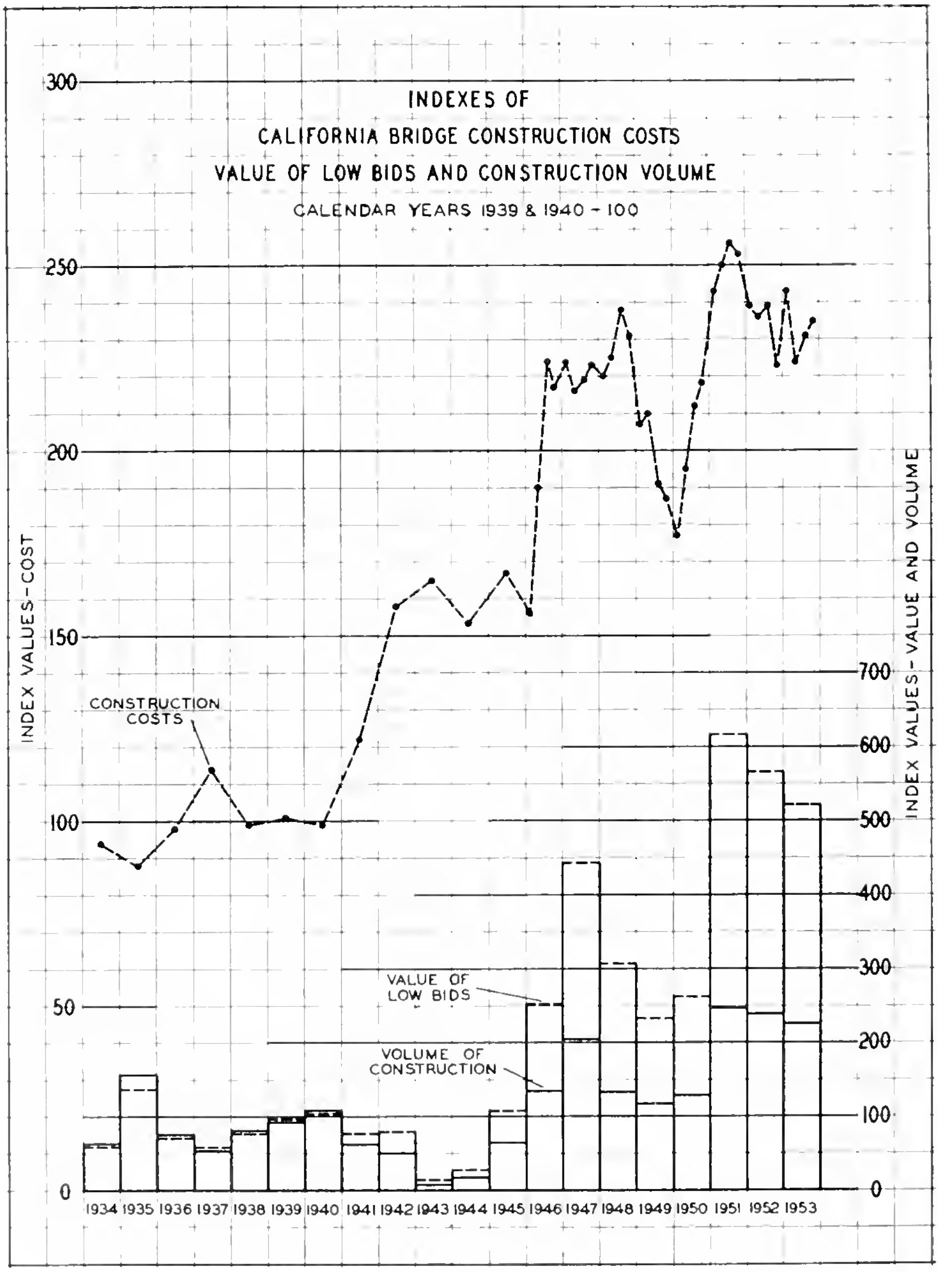
For total highway costs, of which bridge costs are but a portion, the reader is referred to a series of articles entitled *Cost Index,* by R. H. Wilson, H. C. McCarthy, R. R. Norton, and J. D. Gallagher, the most recent of which appears in the November-December, 1953, issue of the same publication.

Inflationary conditions accompanying the Korean War pushed California bridge construction costs to an all-time high during the year 1951. The ensuing cost decline, which started late the same year, continued until mid-1953 when the trend was reversed, at least temporarily, and costs once again started upward.

During the first quarter of 1953 costs underwent a sharp but temporary increase indicating, possibly, an attitude of caution in view of the removal of governmental restrictions affecting the construction industry. The cost increase was short-lived, for a show of highly competitive bidding returned second-quarter costs to the level which existed prior to the sudden rise. During the last six months of the year, however, costs began a slow ascent marked by successive increases of 2 percent and 3 percent in the quarterly level of costs. The cost level for each quarter of 1953 can be found in the accompanying chart which indicates the course of California bridge construction costs since 1934.

Determination of Costs

California bridge construction costs are reported in the form of an index which compares the total cost of a schedule of representative work during a given period with the total cost of the same schedule of work during the base period, the calendar years 1939 and 1940. The fixed schedule of work contains the 14 major contract items of work called for in bridge construction; the quantities of the items are the sums of the respective item quantities in all projects on which bids were received during the base period. Periodic cost of the fixed schedule is obtained by applying the 14 average unit prices for the period



to the fixed quantities; these average item unit prices are computed from the low bids on all bridge projects on which bids were received during the particular period. The 14 items of work, the respective base-period quantities, and the average base-period unit prices can be found in *Table II*.

Volume of Bridge Construction

In addition to construction costs, the chart illustrates the annual levels of expenditure by the State for bridge construction and the resulting physical volume of work. The information is shown in index form with the years 1939 and 1940 as the base. The three indexes shown in the chart appear in tabular form in *Table I* along with levels of expenditure expressed in millions of dollars.

General Trends

Bridge costs reached their record high during the third quarter of 1951 as the most serious dislocations accompanying the Korean War were being felt locally. Some relief was seen late the same year, however, and by the end of 1952 costs were down approximately 12 percent from the 1951 peak. Costs underwent a brief up-down movement early in 1953 which terminated in a moderate upward trend—taking costs, as of the fourth quarter, to within 7 percent of the 1951 peak.

The cost data used in the preparation of the bridge index shows that, among the 14 contract items of work considered, the various items of structural steel have contributed the most to the gross fluctuations of costs during the past several years, and the items of concrete have contributed the most to the long-run rise in the level of costs. As of the last quarter of 1953, structural steel items stand at approximately 200 percent of the base price level. Concrete items stand at approximately 275 percent of the base level, and the other contract items range between the two with the notable exception of excavation which remains at approximately 150 percent.

The rising level of costs during the last half of 1953 does not indicate any relaxation of competition in bidding. Bid records for the past two years

TABLE I

INDEXES RELATING TO CALIFORNIA BRIDGE CONSTRUCTION AND PERIODIC DOLLAR VALUES OF LOW BIDS ON CALIFORNIA BRIDGE CONSTRUCTION

I Year	II Quarter	III Index of the Cost of California Bridge Construction (1939-1940 = 100)	IV Index of the Value of California Bridge Construction (1939-1940 = 100)	V Index of the Volume of California Bridge Construction (1939-1940 = 100)	VI Dollar Value of Low Bids on California Bridge Construction (in millions of dollars)
1934		94	60*	64*	3.1
1935		88	138*	157*	7.1
1936		98	72*	73*	3.7
1937		114	60*	53*	3.1
1938		99	78*	79*	4.0
1939		101	99*	98*	5.1
1940		99	101*	102*	5.2
1941		122	78*	64*	4.0
1942		158	80*	50*	4.1
1943		165	16*	9*	.8
1944		153	29*	19*	1.5
1945		167	109*	65*	5.6
1946	1st	156	342	219	4.4
1946	2d	190	247* 295	133* 155	12.7 3.8
1946	3d	224	148	66	1.9
1946	4th	217	202	93	2.6
1947	1st	224	280	125	3.6
1947	2d	216	443* 629	202* 291	22.8 8.1
1947	3d	219	450	206	5.8
1947	4th	223	412	185	5.3
1948	1st	220	233	106	3.0
1948	2d	225	307* 365	134* 162	15.8 4.7
1948	3d	238	381	160	4.9
1948	4th	231	249	108	3.2
1949	1st	207	186	90	2.4
1949	2d	210	233* 342	117* 163	12.0 4.4
1949	3d	191	194	102	2.5
1949	4th	187	210	112	2.7
1950	1st	177	124	70	1.6
1950	2d	195	262* 357	129* 183	13.5 4.6
1950	3d	212	171	81	2.2
1950	4th	218	396	182	5.1
1951	1st	243	528	217	6.8
1951	2d	250	617* 948	247* 379	31.8 12.2
1951	3d	256	598	234	7.7
1951	4th	253	396	157	5.1
1952	1st	239	396	166	5.1
1952	2d	236	561* 1,017	237* 431	28.9 13.1
1952	3d	239	652	273	8.4
1952	4th	223	179	80	2.3
1953	1st	243	140	58	1.8
1953	2d	224	522* 707	227* 315	26.9 9.1
1953	3d	231	893	387	11.5
1953	4th	235	350	149	4.5

* Average quarterly information.

show a progressive increase in the number of bids received per project. Several projects during the past year attracted 20 or more bids, and the yearly averages of bids per project showed increases from the preceding year of 30 percent and 40 percent for the years 1952 and 1953 respectively.

Outlook

The degree to which the various cost levels during the past few years have been determined by intangible factors is indicated by the failure of wage rates and materials prices to explain the decline of costs since 1951. Factors such as the realignment of rhe

TABLE II

TOTAL QUANTITIES, WEIGHTED AVERAGE PRICES, AND DOLLAR AND RELATIVE VALUES OF LOW BIDS FOR 14 PRINCIPAL ITEMS OF WORK IN CALIFORNIA BRIDGE CONSTRUCTION, CALENDAR YEARS 1939 AND 1940

Items of work	Total base period contract quantities	Weighted average prices	Dollar values of base period low bids	Relative values
Structure excavation	156,286 cu. yds.	$1.56	$244,398.00	3.24%
Class "A" Portland cement concrete (structures)	176,634 cu. yds.	18.42	3,252,837.00	43.13%
Class "A" Portland cement concrete (footing block)	12, 774 cu. yds.	12.04	153,745.00	2.04%
Structural steel (plate girder)	5,810,000 lbs.	.077	450,221.00	5.97%
Structural steel (rolled beam)	4,953,000 lbs.	.063	310,900.00	4.12%
Structural steel (truss)	7,884,000 lbs.	.099	782,269.00	10.37%
Miscellaneous iron and steel	766,630 lbs.	.138	105,639.00	1.40%
Bar reinforcing steel	35,958,000 lbs.	.040	1,440,424.00	19.10%
Furnishing steel piling	79,329 lin. ft.	1.79	142,168.00	1.88%
Furnishing concrete piling	146,861 lin. ft.	1.60	235,477.00	3.12%
Driving steel piling	2,313 ea.	25.29	58,490.00	.78%
Driving concrete piling	3,781 ea.	40.84	154,411.00	2.05%
Steel bridge railing	21,709 lin. ft.	5.93	128,798.00	1.71%
Concrete bridge railing	42,976 lin. ft.	1.91	82,190.00	1.09%
Totals			$7,541,967.00	100.00%

supply of labor and materials, increased efficiency on the job, and stiffening competition in the industry have been largely responsible for the decline. During the past year, however, as the downward trend of bridge costs halted, it became apparent that the rate of readjustment was slowing down. Bid prices in the future may follow more closely the trends of wage rates and materials prices.

Wage agreements during the past year gave hourly rate increases ranging from 10 cents to 15 cents to the basic trades; fringe benefits added substantially to the increase of labor costs.

The nominal prices for some basic materials increased during the year, but stiff competition among suppliers held the general level of prices steady.

The outlook for 1954 holds no indication of increases in materials prices, while labor costs are expected to rise only moderately. Accordingly, in view of recent predictions from Federal Government sources that there will be no substantial change in the level of construction activity during 1954, the prospects are good for a leveling of the recent upward trend of bridge construction costs.

Cost Index . . .

Continued from page 47 . . .

reau of Public Roads Composite Mile Index and the Engineering News-Record Construction Cost Index is shown on the accompanying chart. The Engineering News-Record Index for the fourth quarter of 1953 is up 1.1 percent over the second quarter and the U. S. B. P. R. Composite Mile Index for the third quarter of 1953 was 0.5 percent over the second quarter.

In spite of the talk of "correction" of prices (in lieu of the words "recession" or "depression") and in the face of statistics on increasing unemployment, the records of bid openings on California state highway construction projects give no indication of any appreciable lowering of construction costs.

WEAR WHITE AT NIGHT

A large metropolitan police department made a check of the clothing worn by pedestrians killed in traffic at night. About four-fifths of the victims were wearing dark clothes and one-fifth light-colored garments. This study points up the rule that pedestrians are less likely to encounter traffic mishaps at night if they wear or carry something white after dark so that drivers can see them more easily.

Paul Dunckhorst

After 39 years of continuous service with the State, Paul Dunckhorst, assistant bridge engineer of the Bridge Department, Division of Highways, retired February 1st.

He had been with the Bridge Department for more than 30 years, since May, 1923, and in point of service was one of its oldest employees. He joined the department shortly after it was formed with less than a dozen employees and watched it grow to its present size of more than 600.

PAUL DUNCKHORST

Dunckhorst is a native of Sacramento, born June 23, 1891, at 1225 J Street, which is now in the downtown business section. He attended grade and high schools in Sacramento and subsequently studied engineering.

First Engineering Job

His first engineering job was with the Pacific Telephone and Telegraph Company in Sacramento, where he started work as a draftsman in January, 1910. In September, 1912, he left the telephone company to join a survey party of the Dozier Construction Company during construction of the Oakland, Antioch & Eastern Railway from Sacramento to Glide, in Yolo County.

In July, 1914, Dunckhorst went to work for the State with Division III of the California Highway Commission, which at that time had offices in the Forum Building, Sacramento. With the exception of three years with the State Reclamation Board in 1916-1918, and a period of four months in 1918 with the U. S. Army, his career continued with the Division of Highways.

The many friends Paul Dunckhorst made in that long association will wish him many happy years in his retirement, in which he will have time to pursue his hobby of photography and to carry out plans to do some extensive traveling.

What I Have Learned From the Bridge Department of the State of California

By W. T. CHANG, Senior Highway Engineer and Chief Bridge Engineer
Taiwan Highway Bureau, Taiwan (Formosa), China

I CAME to the United States under a training program which was sponsored by the Foreign Operations Administration of the State Department of the United States, formerly the Mutual Security Agency. Its purpose is to give technical assistance to foreign countries. My travels in the United States were arranged by the Bureau of Public Roads. I was proposed by our government, the Republic of China, and was approved by the United States Government. Ever since I graduated from the university it has been my desire to get a chance to do postgraduate study in the United States. When I got this lucky chance, I was a very happy man.

Before coming to the United States I was the Chief Highway Bridge Engineer in Taiwan which most people know as Formosa. Formosa is a Portuguese word which means beautiful. We call it Taiwan because it is our Taiwan Province just like California is a part of the United States.

Interesting Statistics

Taiwan has an area of 14,000 square miles, about one-eleventh the area of the State of California, and has a population of 8,000,000. There are 10,000 miles of highways and 11,000 auto vehicles. Of course, most of them are trucks and buses. The average traffic on our 1,000 miles of trunk highways is 500 auto vehicles per day. Any structure whose span length is over 10 feet in length is called a bridge; under that we call it a culvert. There are 7,233 bridges, 10,653 culverts and 35,103 pipe culverts in Taiwan. If we add the length of bridges together the total sum is 67 miles. As to the type, there are suspension bridges, arches, steel trusses, plate girders, and various kinds of reinforced concrete and timber bridges. The loadings are approximately from H-4 to H-15. The longest bridge has a length of 1.2 miles with a series of 200-foot spans.

W. T. CHANG

Perhaps you can get some idea of our bridge construction from the accompanying two pictures. *Figure 1* shows a 110-foot span length arch, open spandrel type reinforced concrete bridge under construction. *Figure 2* shows an old 400-foot suspension bridge now being replaced by a 140-foot arch bridge and five spans of 46-foot cantilevered reinforced concrete girder bridges. Its highest reinforced concrete bent is 66 feet high. Because the depth of water in the channel was 26 feet, the centering of the arch was designed by using three-hinged timber trusses. You can clearly see one of the timber centering trusses in the picture.

Bridge Problems

Our difficult bridge problems come from three factors. They are earthquakes, floods and typhoons. Earthquakes in Taiwan are very serious. In our records one could find many bridge failures because of earthquakes. We arbitrarily chose the seismic coefficient as 1, 1.5 or 2 depending upon the location. We know this is not scientific, but we haven't enough data to develop a better method. The general slopes of river beds are very steep. The ridge in the central part of the island is about 12,000 feet high. The widest part of the island is about 80 miles. If we use one-half of 80 miles to divide the 12,000 feet, we get an average slope of more thon 5 percent in the beds of our streams. During flood the velocity of current is terrible, sometimes as high os 40 feet per second. Nearly every year we have bridges washed out or bridge piers settled from scouring. Typhoons are the combination of swift wind and large storm. Lost year we had o typhoon which had a wind velocity of 60 miles per hour. It blew down tall buildings and flooded the highways. Several years ago we had two suspension bridge failures from typhoons. Nearly every year we suffer a great loss.

Due to gradual increases either in loading or traffic we must strengthen and widen our existing bridges. Because we are limited in the type of construction and equipment available, our design work presents many problems. We must design so that we can build with what we have.

Arrives in San Francisco

With those problems in mind I hoped to find solutions in the United States. The first place at which I landed was San Francisco. It's a place I have dreamed about for years. I have learned that the two longest suspension bridges in the world are in that city. One is the Golden Gate Bridge which is the longest in span length. The other is the San Francisco-Oakland Bay Bridge which is the longest one. Unfortunately I had only a chance to view it from far away. Hoping to have another chance, I arrived at Washington, D. C. Finally the U. S. Bureau of Public Roads put the Division of Highways of the State of California on my program. I had heard that California has a very large Bridge Department which was considered to be the best one in the United States. Everyone congratulated me and I felt very happy.

September 10, 1952, I started my adventure in the California Bridge Department. When I entered the great and beautiful Public Works Building, the first thing to surprise me was the Bridge Department signboard with characters painted in golden color. In China golden color represents age and fame.

The Bridge Department of California has many employees including structural engineers, hydraulic engineers, geologists, architects and clerks. They are well organized to cover all phases of bridge work. They have very high technical standards and are very progressive. They train the young engineers and do research work. Their success benefits not only the people of California but also all mankind.

Impressed by Freeway

As one comes to San Francisco, he first sees the Bayshore Freeway with portions of long bridge structures built of welded steel girders. Its aesthetic beauty attracts everyone's attention. One can very easily see the beauty and economy of that structure, but may not realize that the design work resulted from painstaking studies. Structural engineers may be surprised at those cantilever bents, yet they do not know they used the channel-shaped bents with the lower flange buried in the foundation. This marvelous success in the application of structural theory brightens the history of structures.

Bridge designers usually consider the A. A. S. H. O. Standard Specifications for Highway Bridges as a bible. If one wants to design a box girder type reinforced concrete bridge, he will have trouble in finding specifications in that book. A box girder bridge is very beautiful and is very good when the bridge is on curve. The State of California has built many bridges of this type. Its engineers have enough experience to recommend a proposed specification for its design.

Prestressed Concrete Bridges

The economical value of prestressed concrete bridge still is a moot question in the United States. California is very progressive in developing the technique of design of this type of bridge. It has built several of them. It cooperated with the University of California in making some tests on this type of construction. They engineers have the scientific spirit to make further studies in order to develop their techniques.

One type of orch bridge constructed in Formoso

California has various kinds of difficult hydraulic problems in connection with its bridges. It has a research section to make special studies for each problem. It has also developed a chart to solve the design of culverts and has published a bulletin on California culvert practice. In that bulletin is discussed many difficult problems of the design work. I know that the Bureau of Public Roads is doing the same kind of research work, too.

Appreciates Help Given

Sometimes the foundation of a bridge costs very much. Every year we spend a lot of money in foundation work. We are anxious to get some new equipment to get field data at the bridge site in order to improve our design. As yet we haven't found suitable equipment to fit our conditions. The California Bridge Department has designed a drill rig for the investigation of bridge foundations. It is the most portable equipment that I have ever seen.

Bridge engineers have difficulty in finding new books about the application of highway bridge engineering principles. The California Bridge Department has published many manuals and charts that include almost everything pertaining to its bridge engineering. It is planning to publish more. I consider these manuals as the best series of books on modern highway bridge engineering. I am very happy that I had the chance to read these manuals and to get copies of them.

The most valuable thing that I have learned from the California Bridge Department is that the solution of bridge problems requires thorough investigation of everything contributing to the problem and the proper application of engineering principles and good judgment in arriving at correct solutions. The training they have given me in their methods of organizing their operations to use their skilled engineers and their special equipment to best advantage will be of valuable assistance to my people. Their friendship and kindness to me is highly appreciated.

FAS Project

Reconstruction of Pacific Avenue in San Joaquin County

By CLEMENT A. PLECARPO, Office Engineer, San Joaquin County Highway Department

In 1852 several citizens of San Joaquin County petitioned the Court of Sessions (predecessor to the board of supervisors) to lay out and establish a county road from Stockton to Dry Creek near what is now Galt. The road was surveyed apparently along an existing roadway or trail and was known as the Lower Sacramento Road. This road extended from the north city limits of Stockton at North Street (now Harding Way) to a toll bridge at the Calaveras River; thence in a northerly direction to Wood's Ferry (now Woodbridge), where toll was charged; thence northerly to Dry Creek and another toll ferry.

On July 12, 1860, deeds to a right of way 80 feet in width were granted to San Joaquin County for the full length of the road. The highway of today follows the general alignment of the original 1860 road with some alterations and realignment at various points.

An Old Headache

In December 1861 San Joaquin County established a road known as Telegraph Road, beginning at the Five-mile House on Lower Sacramento Road and extending in a northerly direction to Benson's Ferry on the Mokelumne River. The name of this road was later changed to Thornton Road. Thus in 1861 a Y intersection was formed at the Five-mile House which in later years was to give the highway administrators of San Joaquin County many headaches.

In the spring of 1900 San Joaquin County placed the first gravel on the Lower Sacramento Road from North Street (Harding Way) to the Calaveras River, a distance of approximately one and one-half miles, for a cost of $4,000. At approximately the same time a steel pony truss, 70 feet long, was built across the Calaveras River at a cost of $2,067. Later, when the Calaveras River was widened by the construction of the Diverting Canal, timber trestles were built at each end of the pony truss.

Good Roads Campaign

In 1908 San Joaquin County launched a good roads campaign by establishing a highway commission. A bond issue was passed by the voters for $1,890,000, and actual construction of a paved county road system was begun. The Lower Sacramento Road was the first road built and was

Pacific Avenue in 1950, prior to reconstruction under the Federal Aid Secondary Highway Program

Pacific Avenue at Five-mile House intersection looking north. Lower Sacramento Road extends to the upper right. Thornton Road extends to the upper left. Hommer Lane extends east and west across the upper portion of photo. The old Five-mile House is barely visible in the oak grove of left center opposite large triangular traffic island.

constructed at a total cost of $232,186 for 20.16 miles. That portion of the Lower Sacramento Road between the Stockton city limits and the Five-mile House consisted of 4 feet by 14 inches of asphaltic concrete pavement over 3 inches of base gravel. Work was completed in April, 1911. During the ensuing years the pavement was widened to 20 feet.

In 1921 a reinforced concrete bridge was built across the Calaveras River. This bridge was designed by Julius B. Manthey, who is now the San Joaquin County Road Commissioner.

After the College of Pacific was constructed in 1924, all of the Lower Sacramento Road between Harding Way and a point just south of the Calaveras River became a part of the Stockton street system and was renamed Pacific Avenue.

First Subdivision

In 1936 the first subdivision was developed just north of the Five-mile House, and the development of the northwest suburban area north of the City of Stockton was on its way. Subsequently many more subdivisions were developed, and thousands of homes were constructed between the Calaveras River and the Five-mile House.

In 1946 that portion of the Lower Sacramento Road between the city limits of Stockton (just south of the Calaveras River) and the Five-mile House, and also the Thornton Road became Federal Aid Secondary Route No. 543. The Lower Sacramento Road north of the Five-mile House became FAS Route No. 902 (later changed to FAS Route No. 641).

On June 24, 1946, a petition was submitted by property owners in the area between the Calaveras River and the Five-mile House, calling for the improvement of the Lower Sacramento Road.

In 1948 San Joaquin County renamed that portion of FAS Route No. 543 between the Stockton city limits and the Five-mile House, Pacific Avenue.

Pacific Avenue Problem

In 1950 San Joaquin County began a study of traffic conditions on Pacific Avenue to determine the need of reconstruction. Extensive traffic counts indicated that 14,000 vehicles per day crossed the Calaveras River Bridge. It was found that at certain times during the day traffic was completely halted by the heavy left turn movements into the various subdivisions. A report with preliminary estimates of costs was submitted to the board of supervisors and authority was given to reconstruct Pacific Avenue as an FAS project. Additional right of way was acquired to give a minimum of 100 feet width.

On May 22, 1951, the Bureau of Public Roads approved the program submitted by San Joaquin County. Construction was scheduled by stages with the work to extend over three budget years. It was proposed to construct ultimately a four-lane divided highway consisting of four 11-foot travel lanes, an 18-foot median strip and two 10-foot shoulders.

The author, under the supervision of Julius B. Manthey, county road commissioner, designed the project and all preliminary and construction engineering was performed by San Joaquin County forces.

Lower Sacramento Road on Pacific Avenue extension in San Joaquin County. North end of F.A.S. project S-54312 looking south toward Stockton in the distance.

New Calaveras Bridge

The first stage of construction consisted, in general, of constructing a new bridge across the Calaveras River, of reconstructing the railings and replacing the surfacing on the existing bridge, of constructing the southerly approach to the two bridges, and of widening about 2.7 miles of existing pavement north of the Calaveras River. The contract for this stage of work was awarded to Geo. Pollock Company on September 18, 1951, and the completed work was accepted by the Director of Public Works on August 4, 1952. Charles B. Wong and Douglas C. Nelson were resident engineers on this project.

The second stage of construction consisted, in general, of constructing the west curb of the median strip and the west two travel lanes and shoulder. The contract for this stage of

. . . Continued on page 60

Motor Vehicle Use

California Engaged in Comprehensive Study

By F. M. REYNOLDS, Principal Highway Engineer

MOTOR VEHICLE USE STUDY

The motor vehicle is taken for granted as an essential adjunct of modern American life. This is particularly so in California, which has frequently been described as "a state of rubber-tired wheels." The importance of the motor vehicle in all aspects of personal and economic life was impressed on California and the rest of the Nation during World War II by the necessary imposition of restrictions on motor travel. Since World War II, motor vehicle use has increased heavily everywhere, and in California the vehicle registration is now double what it was in 1940.

For many obvious reasons it is desirable to obtain the *facts* about the use of the motor vehicle. In other words, just how essential is the motor vehicle to our economy?

Nation-wide Study

On a nation-wide basis, the answer to this question is being sought by the United States Bureau of Public Roads, the agency which administers the allocation of federal highway and road funds to the various states. This study has been completed, or is underway in 25 states.

In California the responsibility for the motor vehicle use study was assigned to the State-wide Highway Planning Survey, a unit of the Planning Department of the State Division of Highways. Under agreement with the Division of Highways, the home interview information collection phase of the study, including selection of the dwellings to be contacted, is being performed by the United States Bureau of the Census.

Bureau of Census Cooperates

Participation in this type of project by the U. S. Bureau of the Census is to the mutual advantage of both the state and federal agencies. It provides an opportune time for the U. S. Bureau of the Census to develop additional trained enumerators for its use in future census surveys, and it makes it unnecessary for the Division of Highways to employ and train a supervisory staff and enumerators for the sampling and home interview phase of the survey.

For the purpose of this study the State was divided into 11 regions. (*See map.*) Statistics on the use of the motor vehicle can be developed for each of these regions with equal accuracy and the prevailing north-south county grouping comparison can also be secured.

Since it is not economically feasible to collect the information from the entire population, a sample of households is taken for interviewing. The accuracy of a scientifically designed sample is to a large extent dependent

A. VEHICLE IDENTIFICATION

1. Make [redacted]
2. Vehicle Type Passenger — P
Year Model — 52
3. Body Type 4 Door — B
4. Registered unladen weight (*Trucks and combs. only*) — lbs. X —
5. Was vehicle purchased new — Yes X No
6. When purchased (*Month and Year*) — 04 53
7. Months owned or used during last 12 months — 07

8. Estimated total mileage during this period 5767 miles — 006
9. If ownership changed: show total miles traveled during past 12 months in this vehicle and vehicle(s) it replaced — miles
10. Present speedometer reading 5767 miles — 006
11. Estimated miles per gallon — 27
12. Type fuel..... Gas [X] Diesel [ ] Other [ ] (*Specify*)
13. Fuel consumption card left...MVU-2 - Yes [X] No [ ] MVU-2S - Yes [ ] No [X]
14. Did this vehicle driven by members of this household complete any round-trip of 400 or more miles either yesterday or the day before yesterday? Yes [ ] No [X]

RESIDENCE CODE

on its size. In this case the sample was so designed statistically that the error due to sampling variability was 3½ percent (coefficient of variation), requiring the inclusion of approximately 1.3 percent of the estimated 3,600,000 dwelling units within the State.

The interviewing of all the people in these 46,000 selected dwelling units has been scheduled and distributed over a year's period, starting early in 1953.

Border Interviews

In addition to the information secured from the selected home interviews conducted dy the Bureau of the Census, supplementary information is being obtained by the Division of Highways from interviews at the state borders with nonresidents. These border interviews will make it possible to estimate the amount of the total vehicle travel in California which is attributable to nonresident visitors.

The study is so set up and designed that the over-all result will be a composite traffic pattern of all motor vehicle travel in the State of California for a representative 24-hour period.

The schedule illustrated herewith was mutually acceptable to the departments concerned and is believed to include the maximum amount of information feasible for collection in a home type interview.

On the front of the schedule the dwelling unit is described and information on members of the household is listed. The right side of the same sheet (*not illustrated*) is used for the administrative record.

The reverse side of the form (*see illustrations*) is used to describe the vehicle and to record in detail the trips for each vehicle driven by a member of the selected household for specified travel dates. Supplemental sheets are used for additional vehicles and for those households where more than five trips in a vehicle are completed on the specified day.

Informotion Confidentiol

The information obtained in the interviews is, of course, confidential, like any census information. The numbers which are noted in the boxes at the bottom of various sections of the form are for coding purposes, used in transferring the data to tabulating cards.

It will be noted that in addition to recording the terminus of each trip and its purpose, the form also provides for describing the route followed in each case. Although there are practical limitations to the extent of analysis which can be made of this information, it will be possible without too much difficulty to determine:

1. The number of trips and vehicle miles generated for or in connection with earning a living, family business, or for social and recreational purposes;

2. The number of trips and vehicle miles that are made by commercial vehicles;

3. The number of trips and vehicle miles on each of the three major categories of traffic facilities within the State: state highways (urban and rural), county roads and city streets. For the mileage inside cities, summaries will be available by population groupings for cities of less than 5,000 population, those in 5,000-24,999 bracket, those from 25,000 to 99,999 and cities over 100,000. These summaries will cover not only the mileage traveled by residents of cities in the four population groups both inside and outside their home cities, but also the mileage traveled inside the various size cities by all persons using motor vehicles, regardless of where in California they live;

4. The number of "to work" trips by modes of transportation, segregated by "distance to work" groupings.

Sheet 1 of 1 Sheets

0 B. TRAVEL DATA FOR:
~~Oct~~ 20 53
Month Day Year
Tuesday 3
Day of Week

Region and Sample No. B999
Population group — 6
Vehicle number — 1

C. OWNERSHIP AND OCCUPATION INFORMATION

1. Owner (letter) — A
If "borrowed" or "rented" car was used, check: [ ] Borrowed [ ] Rented
Occupation and industry — 0 AJ
2. Principal user (letter) (if other than owner) — A
Occupation and industry — AJ

Confidential - The information obtained in this survey will be accorded confidential treatment by the U. S. Bureau of the Census, the California Division of Highways and the U.S. Bureau of Public Roads for whom the data are being collected. Individual reports will be used for statistical purposes only and will be seen only by authorized employees of these agencies, who are assigned to work on this project. Only statistical summaries will be published, and individual returns will not be used for purposes of regulation or administration of any program.

Form MVU-I
(12-30-52)

U.S. DEPARTMENT OF COMMERCE - BUREAU OF THE CENSUS
Acting as Collecting Agent for the CALIFORNIA DIVISION OF HIGHWAYS
in Cooperation with the U.S. BUREAU OF PUBLIC ROADS

MOTOR VEHICLE USE SURVEY

I - IDENTIFICATION

(1) LOCATION: City Sacramento County Sac

Address [redacted] Apt. No. ______
(Street, Road, RFD Box No.)

Phone No. [redacted] If Rural ______ mi. ______ from ______
(Direction) (Nearest town)

On Road No. ______ Sec. ______ Twp. ______ Range ______

(2) SURFACE TYPE OF ROAD SERVING DWELLING UNIT
Trail.. ☐ 1 Earth.. ☐ 2 Gravel. ☐ 3
Blacktop......... ☐ 4 Concrete......... ☐ 5 City or Village St.. ☒ 6

(3) DISTANCE TO ALL WEATHER ROAD (Total Miles to Nearest Tenth) —

(4) COUNTY CODE........ 34

(5) CITY AND POPULATION GROUP CODES........ 62706

(6) REGION AND SAMPLE NUMBER CODES........ 89999

(7) ROAD SYSTEM OF RESIDENCE........ 3

(8) **IF DWELLING UNIT IS ON A FARM WHAT IS TOTAL NUMBER OF ACRES IN FARM**........ —

(9) RESIDENCE CODE......

(10) DWELLING UNIT TYPE

Single Family:
Attached..........A ☐
Detached..........B ☐
Trailers..........C ☐

Multi-Family:
Apartments..........J ☐
Duplex or Flat......K ☒
Resident Hotels.....L ☐

Other *(Describe)*______ Z ☐

Non-Dwelling Unit Quarters:
Dormitory..............S ☐
Fraternity & Sorority...T ☐
YMCA or YWCA...........U ☐
Motels..................V ☐
Hotels..................W ☐

II - OCCUPANTS OF DWELLING UNIT

(Ask Only of Persons 14 Years Old and Over) — FOR PERSONS WITH OCCUPATIONAL ENTRIES IN COL. 6

Line * (1)	Relationship (2)	Code	Sex (3)	Age (4)	Driver Permit (5)	Did this person do any work at all last week?† (If worked one or more hours, enter the occupation; If did not work, enter housewife, student, retired, etc.) (6)	Code	What kind of business or industry did this person work in? (7)	Code	How did this person travel to this job on last week day worked last week? (Enter codes) (8)	LEAVE BLANK	What is the distance to this job in 1/10 miles? (9)
A	Head	A	M	31	Yes	Statistician	A	State Govt.	J	1	A	01.9
B	Wife	B	F	28	No	Housewife	K		L		0	—
C	Son	D	M	00	No		T		T		0	—
D			M F		Yes No							

3

* Circle line letter(s) of person(s) interviewed.
† If had regular job but did not work last week, enter in column (6) reason: on VACATION, on STRIKE, or was SICK. Also enter Occupation and Industry in columns (6) and (7). If worked on two or more concurrent jobs last week, enter principal occupation and industry worked at. If changed jobs during week enter occupation and industry for last job.

III - VEHICLE INVENTORY

How many vehicles are driven regularly* by members of this dwelling unit?
(Include all vehicles driven regularly regardless of ownership or where vehicle is garaged.)
* "Regularly" means that the person drives that vehicle more than anyone else, i.e., he is the principal user.

Cars	Trucks	Others
01	00	00

IV - SUMMARY *(Fill after Interview)*

Occupants of Dwelling Unit: Total Number M	F	Number of Legal Driving Age M	F	Number Holding Driver Permits M	F	Total No. of Trips MVU
02	01	01	01	01	00	04

CODES FOR COLUMN 8

1. Driver of vehicle (auto, taxis, trucks, pickups).
2. Passenger of vehicle (auto, taxis, trucks, pickups).
3. Passenger of bus, internal combustion.
4. Passenger of bus, trolley.
5. Passenger of streetcar.
6. Passenger of railroad.
7. Walked only, or lives at site of work.
8. Other (Ferry, motorcycle, bicycle, etc.)

Comments: ______

Where applicable, the information can be further segregated, if found necessary or worthwhile, by such categories as year model of the vehicle used, its body type, or the length of the trip. Still further segregations are possible by region of residence and travel, occupation, and the industry employing the driver. For example, one possible by-product of the Motor Vehicle Use Study in California might be a small-scale origin and destination study depicting the magnitude and direction of the main traffic currents of the entire State.

D. VEHICLE TRIP REPORT

Person (Driver) (1)	Trip No. (2)	Where and when did this trip begin? (3)	Where did this trip end? (4)	From	What was the Purpose of the trip? (5)	To	No. in car including driver (6)
A	1	Home 14th & T st. 07 Time Started 7:30 A.M. P.M.	33rd & Broadway If segment of long trip ENTER DAY OF TRAVEL 3	A	EARNING A LIVING: A.... Work A; B. Related Business B. FAMILY BUSINESS: J.... Medical and Dental J; K. Shopping K; L.... Education, Civic and Religion... L; M. Eat Meal M; N.... Serve Passenger N; O. Home O; P.... Others (Personal, Business, etc.).. P. SOCIAL AND RECREATIONAL: S. Vacation S; T.... Pleasure Ride T; U. Others (Visit friends, etc.) U	A	1
		0048 0072 6270	0063 0067 6270	O			

		What was the Route of the Trip? (7)	Part or Entire Route	Commodity Carried (Description and Approximate Weight) (8)
A	1	East on T, rt on 15th, lt on Broadway		

		TOTAL MILES	UNINCORPORATED State Hwy.	UNINCORPORATED Local	CITY STREETS <5 M	5-25	25-100	>100 M	State Hwy.	Region of Trav.	Trailer Cards	CODE	WEIGHT
A	1	0002	—	—	—	—	—	02	002	B	0	2X	—

Person (Driver) (1)	Trip No. (2)	Where and when did this trip begin? (3)	Where did this trip end? (4)	From	What was the Purpose of the trip? (5)	To	No. in car including driver (6)
A	2	33rd & Broadway 17 Time Started 5:05 A.M. P.M.	Home If segment of long trip ENTER DAY OF TRAVEL 3	A	EARNING A LIVING: A.. Work A; B. Related Business B. FAMILY BUSINESS: J.... Medical and Dental J; K. Shopping K; L.... Education, Civic and Religion... L; M. Eat Meal M; N.... Serve Passenger N; O. Home O; P.... Others (Personal, Business, etc.).. P. SOCIAL AND RECREATIONAL: S. Vacation S; T.... Pleasure Ride T; U. Others (Visit friends, etc.) U	O	1
		0063 0067 6270	0048 0072 6270				

		What was the Route of the Trip? (7)
A	2	Reverse of trip # 1

		TOTAL MILES	UNINCORPORATED State Hwy.	UNINCORPORATED Local	CITY STREETS <5 M	5-25	25-100	>100 M	State Hwy.	Region of Trav.	Trailer Cards	CODE	WEIGHT
A	2	0002	—	—	—	—	—	02	002	B	0	2X	—

Form MVU-1 (12-30-52)

The importance and value of this type of information in planning not only for streets, roads and highways but for the transportation needs of California's growing population is self-evident.

The gratifying fact that the public itself is aware of the value of the study is evident from the high degree of cooperation which the home interviewers have received from the families contacted.

F. A. S. Project . . .

Continued from page 55 . . .

South end of F.A.S. project S-543(2) looking south toward Stockton. College of Pacific buildings middle right, Stockton central district at far left.

work was awarded to A. Teichert & Son on May 12, 1952, and the completed work was accepted by the Director of Public Works on October 28, 1952. Charles B. Wong was the resident engineer on this project.

Third Construction Stage

The third and final stage of construction consisted, in general, of completing the four-lane divided highway and constructing the Five-mile House intersection. The median strip was completely curbed with left turn lanes provided at every intersection. The contract for this stage of the work was awarded to A. Teichert & Son on April 17, 1953, and the completed work was accepted by the Director of Public Works on November 20, 1953. Charles B. Wong was the resident engineer and Elmo Ward and Glen Baumbach were assistant resident engineers. Total cost of the entire project was $628,000.

On November 14, 1953, the Honorable Goodwin J. Knight, Governor of California, and the Board of Supervisors of San Joaquin County officially opened the first four-lane county highway in San Joaquin County. Board of supervisors members in attendance were W. R. Ruggles, chairman, E. H. Rimington, E. G. Stuckenbruck, C. Hawkins and Ed. Heinbockel.

This has been a history of the development of a highway from the early days of the pioneers of 1852, when all travel was by horse and wagon over muddy primitive trails, to the present day, 100 years later, when 17,000 motor vehicles each day use this modern highway.

State Employees in District VII Are Honored

On Friday evening, December 11th, upon the occasion of the annual dinner dance and installation of officers for Highway Chapter 101 of the California State Employees' Association in the Coral Room of the Rodger Young Auditorium Building, a special ceremony was conducted for the award of 25-year service certificates and merit award commendation certificates. The presentation of these certificates to State Highway employees in the Los Angeles area was made by Paul O. Harding, Assistant State Highway Engineer, in charge of District VII. Mr. Harding is a past president of the California State Employees' Association.

The 25-year certificates and also appropriate gold pins were presented to the following: James Butler, Gerald G. Dowling, W. L. Fahey, Jesse A. Fleharty, Jack R. Hodson, Elvin L. Humphrey, William Mitchell, Harold Peasnall, William Reifenstahl, and Freda C. Tapp.

Certificates of commendation that had been earned by employees in this district resulting from valuable suggestions they had made to the California Merit Award Board that will make state operations more efficient and economical were awarded to William V. Hesp, Luther R. Johnson, Andrew A. Lutterbein, and Lilly G. Paddock.

The new officers for Chapter 101 for 1954 that were installed by Mr. Harding are:

Delbert A. Olden, President; C. N. Wilczek, First Vice President; Paul M. Hine, Second Vice President; Dolores Barker, Secretary; Dorothy Williams, Treasurer; James Anderson, Delegate; Jack Barnes, Delegate; Beth Putman, Delegate; and P. R. Reed, Delegate.

When driving through snow areas, use extreme caution; watch for snow removal equipment at work; and remember that it requires from 60 to 90 feet to bring a car to a stop when driving on packed snow at a speed of 25 miles an hour.

ADVANCE PLANNING BY NORTHERN COUNTIES MERITS PRAISE

By L. ARAMAYO, FAS Engineer, District II, State Division of Highways

STATE HIGHWAY DISTRICT II, embracing the Counties of Siskiyou, Modoc, Trinity, Shasta, Lassen, Tehama and Plumas, contains 1,500.3 miles of state highway routes under the jurisdiction of the California Highway Commission.

This northeastern section of California also contains, under the jurisdiction of the several county boards of supervisors, a total of 6,674.4 miles of county roads. Of these county roads, 517.7 miles, including many of the more heavily traveled routes, are included in the Federal Aid Secondary Highway System. The responsibility for administering the federal aid secondary program in California is assigned by law to the Division of Highways, which brings this state agency into close and regular contact with the county supervisors and their county road commissioners.

Local Initiative

Since the activation of the federal aid secondary program in 1945 the policy of the State Highway Engineer has emphasized a maximum of local initiative in the expenditure of federal as well as county funds in the improvement of county roads, based on the conviction that the greatest benefit to the counties and their road users would result from such a policy. It is becoming increasingly evident that the county supervisor group in the District II area feels the same way.

At the frequent group meetings of the Northern Chapter of the County Supervisors Association of California two county road problems have been under study; the need for modern road design to meet ever-increasing traffic demands, and the need for long-range planning. The rather broad acceptance of these views in this section of the State is undoubtedly due to these conferences.

Today all the counties of District II have adopted a continuous five-year construction program which will be financed with federal, state and county funds.

In Memoriam

MERRITT D. RATHBUN

Masonic funeral services were conducted for Merritt D. Rathbun at the McDonald's Funeral Chapel in Redding on November 16, 1953. Interment was made at the Masonic Cemetery, Millville.

Mr. Rathbun was born in Missouri on March 13, 1874. He came to California and to the Millville area in 1905. He entered state service as an auto mechanic at Shop 2 on August 29, 1923. His retirement came March 31, 1944. He was a member of Northern Light Lodge No. 190, F. & A. M., Millville, for more than 50 years.

His loss is deeply felt at Shop 2, Division of Highways, where he was well known and sincerely liked.

Mr. Rathbun is survived by his wife, Nona, and a daughter, Mrs. Nelda Shanahan.

Advantages of Planned Program

The advantages of such a long-range planned program are obvious. One of the primary advantages lies in the time element; the road commissioner is able to work from a prearranged schedule. This enables him, in turn, to plan ahead the most efficient disposition of his survey and design crews. It also allows him the opportunity to study various alternate solutions to a road improvement problem.

Finally, a planned program helps to keep in focus the over-all picture of the county's traffic situation, both the immediate needs and the ultimate goals.

In this way the supervisors, both collectively and individually, are provided with a measure for current and future progress on the improvement of the roads under county jurisdiction. And the people of the county have some assurance that specific projects are not forgotten or indefinitely deferred but have a place in an orderly planned program.

Team Work Valuable

An extra benefit gained from such a planning policy is in the field of federal-state-county cooperation, particularly important for the purposes of the federal aid secondary program. Advance indication of the county's thinking is valuable to the state and federal agencies concerned and helps to streamline the administrative details of the cooperative arrangement.

The supervisors, of course, cannot commit future boards to a definite construction program. They can, however, designate certain projects for early construction and authorize the preparation of surveys and plans on the others. When a project is completed, another one can be approved and a new one added to the continuous program.

The progressive steps taken and the teamwork demonstrated by this group of counties is a concrete expression of the fundamentals of good local government.

ORCHID FOR DIVISION OF HIGHWAYS

ELECTRIC MILLS, MISS.
January 4, 1954

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: Your publication came to my attention here during my sojourn for the month to get away from old man winter in Wisconsin. *California Highways and Public Works*, November-December, 1953, is a good publication about highway construction in your State. There is no use to engage in superlatives about an excellent job of presenting technical matter and data in a readable form. Your highway reconstruction and bridge building are engineering feats of the first magnitude and reading about them makes me ponder the population problem and the auto registration as to where such difficulties will end.

Yours very truly,

O. H. JOHNSON

INDEX TO CALIFORNIA HIGHWAYS AND PUBLIC WORKS

January to December, 1953

INDEX OF AUTHORS

Fellowships for Highway Engineers Are Offered at U. C.

Two Automotive Safety Foundation fellowships for graduate study of highway engineering will be available during the 1954-55 academic year, the University of California has announced.

Each fellowship consists of $1,500 plus fees for two semesters and two summer sessions, taken consecutively. Attendance at the summer sessions will be optional. The fellowships specify that preference be given to those with practical experience in highway engineering since college, but this is not mandatory.

Applicants must be graduates of a recognized engineering school and qualify for admission to graduate standing in University of California.

Applications may be obtained from the Dean of the Graduate Division, University of California, Berkeley 4, and filing must include transcript of record and letters of recommendation.

Although the stated closing date for fellowship applications at the University is February 15th, this might be deferred, according to Harmer E. Davis, director of the Institute of Transportation and Traffic Engineering.

Davis suggested that if interested individuals anticipate difficulty in making a complete submission by the stated closing date they communicate with the institute. He also suggested that an application be made even though an individual is not able to make a final decision immediately about plans for next fall.

In Memoriam

GEORGE R. WINSLOW

Enjoying a well-earned retirement after 29 years of service with the Division of Highways, George R. Winslow of Sacramento met a tragic death in a traffic accident on last December 6th. Mr. Winslow was driving home from Los Angeles on US 99 when he ran into the rear of a truck on the evening of December 2d.

Mr. Winslow came to California in 1912 to become associated with Austin B. Fletcher, who, in 1911, was chosen by Governor Hiram W. Johnson to head the first State Highway Department of California.

Born in Boston, Mass., on May 6, 1871, Mr. Winslow attended the Boston and Somerville public schools and then went to the Massachusetts Institute of Technology. One of his Pilgrim ancestors had charge of the roads at Martha's Vineyard Island. His first engineering work was as rodman on the Boston metropolitan sewer system.

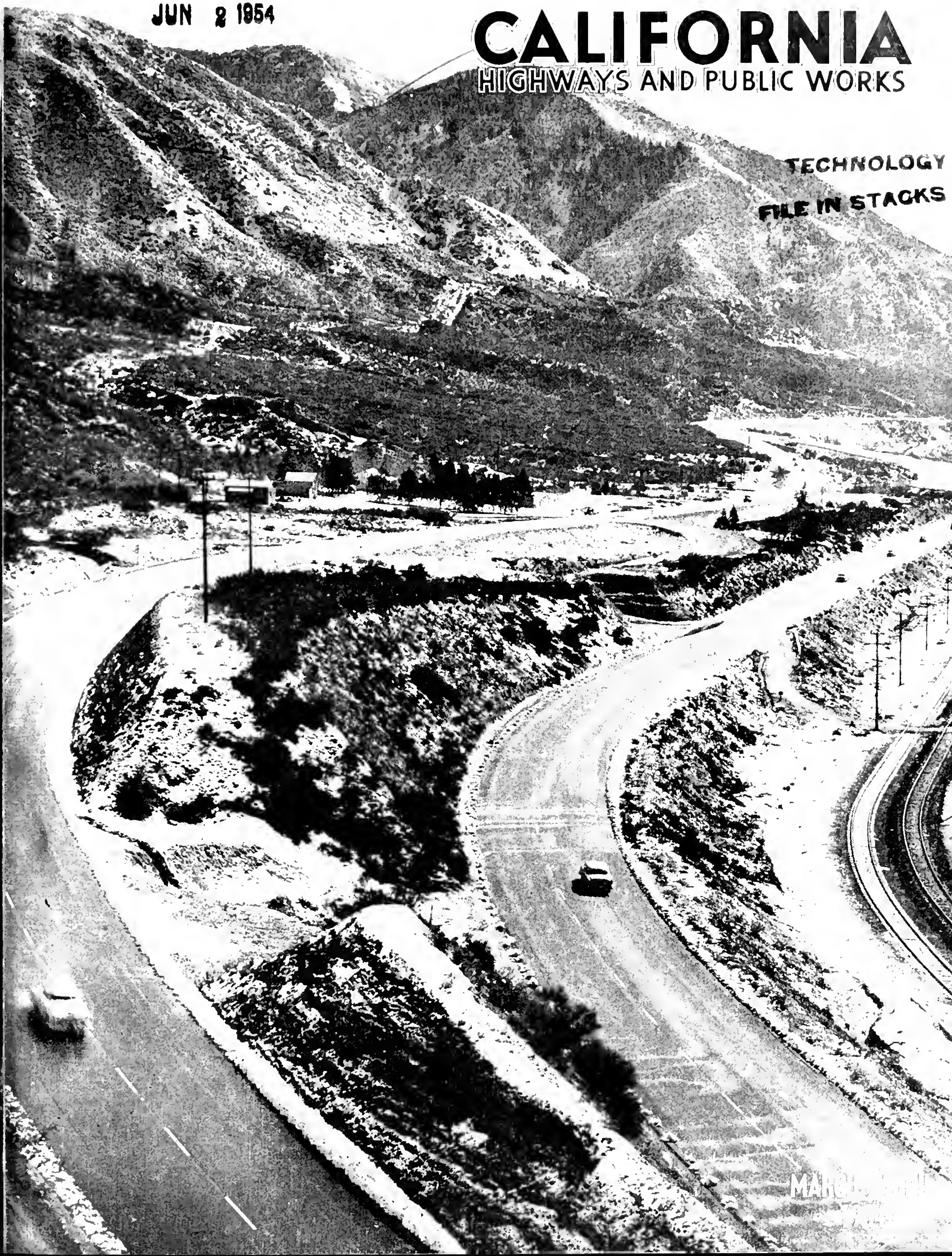
In 1898 he went to work for the Massachusetts Highway Commission and computed the earth quantities for the first contract let by the department. In 1906 he was employed by New York State when road construction under that state's first highway bond issue was launched.

Mr. Winslow and Mr. Fletcher had been friends in Massachusetts and when the latter became State Highway Engineer of California he sent for Mr. Winslow, appointing him Office Engineer of the Division of Highways here. The two men worked out the details of the organization of the department. Mr. Winslow was soon elevated to the post of Assistant Highway Engineer.

In 1920, Mr. Winslow was appointed District Engineer of District III, then in Sacramento, served in that capacity for four years and then was appointed Maintenance Engineer. In 1929 he became Assistant Construction Engineer.

Mr. Winslow is survived by three sons, George F., and Jean Paul, engineers with the Division of Highways, and Arthur Leroy of Reno, Nevada; and two daughters, Mrs. Marian Kiernan, San Luis Obispo, and Mrs. Barbara Urias, Sacramento.

CALIFORNIA
HIGHWAYS AND PUBLIC WORKS



California Highways and Public Works

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KENNETH C. ADAMS, *Editor*
HELEN HALSTED, *Associate Editor*
MERRITT R. NICKERSON, *Chief Photographer*

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Public Works Building Twelfth and N Streets Sacramento

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Address communications to
CALIFORNIA HIGHWAYS AND PUBLIC WORKS
P. O. Box 1499
Sacramento, California

Bay Area Freeways

By B. W. BOOKER
Assistant State Highway Engineer

Multi-million Dollar Program Of Construction Under Way

Strides which have been made in the construction of freeways in the metropolitan area of Los Angeles and vicinity were reported in the January-February issue of *California Highways and Public Works*.

In the major metropolitan district comprising the nine counties in District IV in the San Francisco Bay area, a similar effort to improve highway transportation for a large segment of California's population has and is being made.

Previous reports on the completion of the various important freeway projects have been confined generally to individual contracts or groups of related contracts, resulting possibly in an impression of disjointed progress. To meet particular and pressing needs, and in apportioning available funds, small sections of freeway appeared in a manner which may have indicated no comprehensive plan.

Seventh Year of Program

In this seventh year of construction, and with the aid of further funds, acceleration in the program is unfolding the planned continuity of the system. Short stretches of freeway have expanded to long avenues of modern highway and loose ends are gathered into connected thoroughfares.

The geography of the Bay area imposes severe restrictions upon the design of a freeway system. In connecting the cardinal points of the district, traffic must be funneled into the existing crossings of the extensive bay waters. Further, the primary function of any system of transportation in this area must be the movement of workers from suburban homes to occupational centers. It necessarily follows that points of convergence are in the heavily populated sections of San Francisco and Oakland, presenting a problem in costly right of way, the acquisition of which must conform to the principle of minimum disturbance of established interests consistent with maximum benefit. Thus, it is that the progress of a metropolitan freeway system is governed to a large degree by our ability to purchase right of way and the acceptance by the public of the location and extent of the facility.

B. W. BOOKER

Right of Way Acquisition

In a successful effort to expedite the purchase of right of way, the 1952 Session of the Legislature provided funds for advance acquisition of right of way on highway routes through areas of potential or imminent development. Saved for construction will be millions of dollars of future funds which would have been expended on homes and industrial plants, the building of which can now be kept from the path of planned routes. Further aid was provided by the 1953 Legislature, which increased the advance right-of-way acquisition fund from $10,000,000 to $30,000,000 and at the same time made it a revolving fund. Additional construction revenue was provided by increasing the gasoline tax to 6 cents per gallon, with the other highway user taxes increased in proportion.

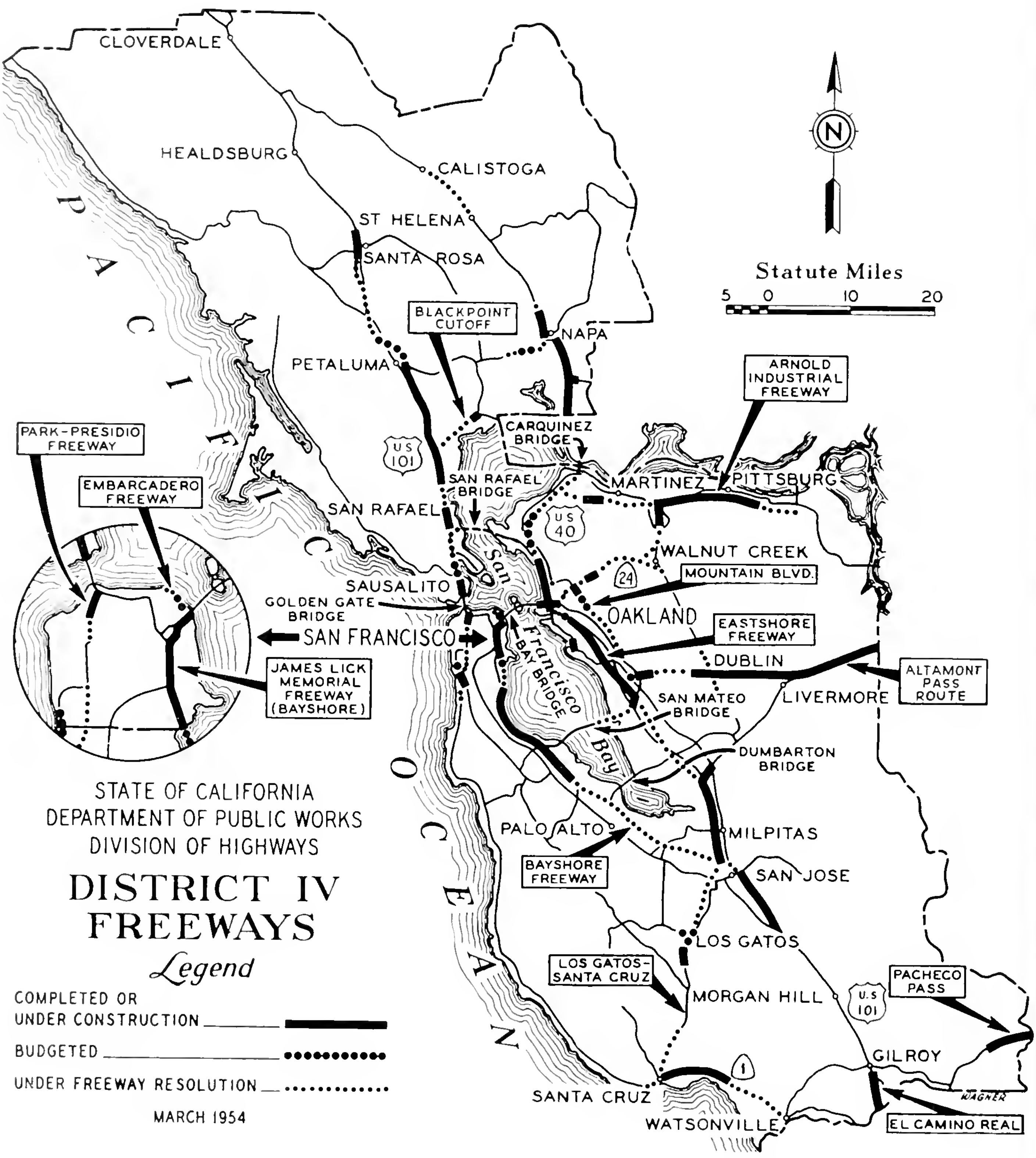
New funds provided by additional highway taxes have produced discernable progress toward an integrated freeway system. The flow of vehicular travel throughout the area already reflects the potentials of modern highway engineering. Full effect of the accelerated program is yet to be felt. The next few years should witness great strides forward in providing a workable measure of modern roads capable of sustaining rapid and convenient movement between residential and occupational centers of the Bay area.

The story of progress since the laying of the cornerstone is told in the development of the routes which are designated by the California Highway Commission as freeways.

The accompanying map and tabulation showing status of District IV freeway projects indicate in a general way the progress that has been made. To date, a total of 140 miles of freeways and expressways have been completed in District IV and 36 miles are under construction.

The total sum that has been expended for completed freeways, freeways in progress and right-of-way acquisition therefor, is $195,000,000.

The budget for the 1954-1955 Fiscal Year which has been adopted by the California Highway Commission, allocates a total in excess of $48,000,000 for expenditure upon District IV freeways, which will add 25 miles of multilane urban freeways and intercity expressways to the highway system in this district.



Thus the total expended and obligated for District IV freeways is $243,000,000 which amount will provide over 200 miles of modern highway transportation facilities in the San Francisco Bay area.

Brief description of the status of each of the District IV freeway projects follows:

BAYSHORE FREEWAY

The Bayshore Highway was originally constructed to relieve the mounting pressure on the El Camino Real. A part of the historical route of the Padres, this north-south route along the bay side of the peninsula not only approached its physical limitations but fell victim to strangulation through roadside development, and finally assumed, to all intents and purposes, the characteristics of a city street.

For many years the Bayshore Highway, known also as US 101 (Alternate), served its purpose well. Carrying through inter- and intrastate traffic, commuter traffic between residential San Mateo Peninsula and San Francisco, and commercial traffic between the industrial centers of the metropolitan area, this primary route soon indicated the need of a freeway development. Its alignment, generally easterly from the peninsula cities, lent itself with few modifications to freeway transition.

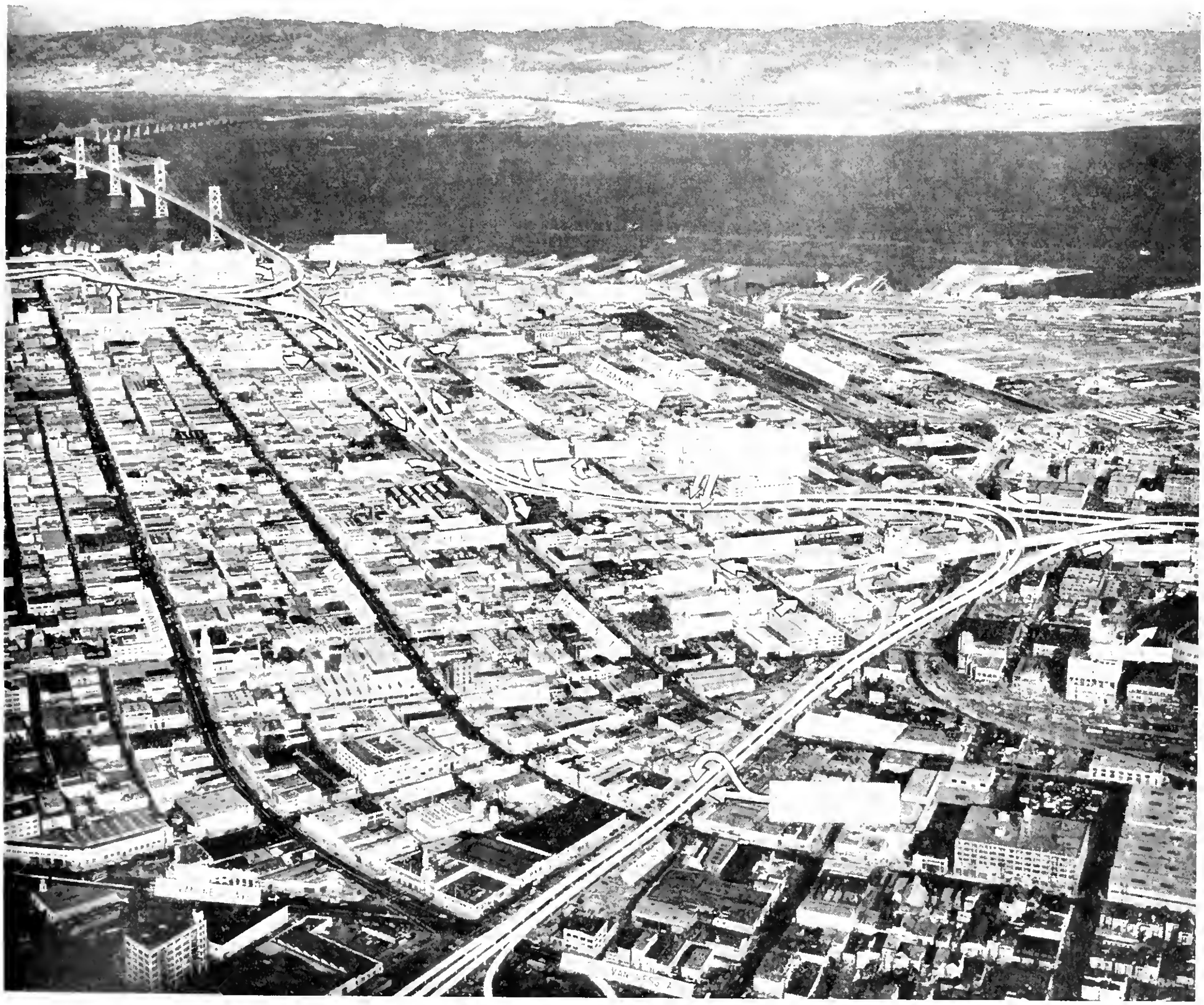
The initial project to be completed as a modern freeway, a short section between Broadway in Burlingame and Peninsular Avenue in San Mateo, was finished in 1947. Constructed as a full freeway, this original link provided controlled access, grade separations and outer highways serving as frontage roads.

Projects Completed

The years 1948 and 1949 witnessed the completion of two contracts involving the South San Francisco and the South San Francisco to Burlingame sections. This completed the full freeway in the vicinity of the San Francisco Municipal Airport, the expansion of which necessitated major changes in highway alignment to the west.

At this point in the development of the Bayshore Freeway the scene shifts to the City of San Francisco where a $6,000,000 mile-and-one-third was completed in June, 1951. In October, 1953, the northerly continuation of the original section was opened to traffic. Traversing a two-mile alignment, 0.7 miles of which is elevated structure, this link connects the Army Street interchange with the freeway off ramps at Bryant Street. This section and the acceptance of the Peninsular Avenue to 16th Avenue project in San Mateo represent the to-date

View of portion of San Francisco looking toward the Bay Bridge and the East Bay, showing freeway units under construction or yet to be constructed. The loop in the lower foreground shows where the 13th Street connection off-ramp will meet South Van Ness Avenue. On- and off-ramps at Eighth Street are shown in the left center of the picture.



Central portion of San Francisco, showing Bayshore Freeway construction extending toward connection with Bay Bridge

completion of the Bayshore Freeway, totaling 14.4 miles in length.

As in all such construction the early stages appear to be a disjointed approach to the problem, but with passage of time a positive pattern appears. Under way and scheduled for early completion are projects which will provide further continuity to the freeway, creating an uninterrupted full freeway facility from San Carlos to the San Francisco-Oakland Bay Bridge, a Bay fill operation between Candlestick and Sierra Points, with the exception of the "Open Water Project."

Projects Now Under Way

The projects now in various stages of construction briefly listed are the Alemany-Third Street section in San Francisco, 1.7 miles in length and scheduled for completion early in 1955; the 16th Avenue, San Mateo, to San Carlos section to be completed late in 1954; and four contracts in San Francisco extending the elevated freeway from the Division Street Wye easterly to Fourth Street and westerly to Mission Street via 13th Street. Bids are now being called for the connecting link to the Bay Bridge, including integrated structures which will provide a take-off for the Embarcadero Freeway.

Construction on the remaining unit on this route in San Francisco, a 0.7-mile section from Third Street to the San Mateo County line, which will connect with the open water fill, will also be started this year.

The total cost of the 6.4 miles of the Bayshore Freeway in San Francisco will amount to $44,000,000, while the entire facility from San Francisco to San Jose, some 48.8 miles in length, will represent an expenditure of approximately $111,000,000 when completed. Traffic count on the route near the San Francisco end is 61,000 vehicles per day.

EASTSHORE FREEWAY

Freeways have taken names, usually of local origin, and these are often lacking in full definition. The limits of the Eastshore Highway were Richmond on the north and San Jose on the south. As signed, the route was mainly State Sign Route 17, a section along the bay between Emeryville and

Richmond being US 40. In its transition to a freeway, Sign Route 17 has left most of its former locale, with a new alignment completely replacing its southerly meandering.

The first completed section of the southern portion of the freeway was opened in July, 1949. Starting at Fifth and Oak Streets, the six-lane full freeway carried traffic to the vicinity of 23d Street. By June, 1950, use of the freeway was available to 98th Street. In July of 1952, a further 4.2 miles carried the freeway to Lewelling Boulevard to San Lorenzo. One more year produced the 3.9-mile section to Jackson Street in Hayward.

While construction proceeded southerly from central Oakland, a 9.85-mile unit was advancing northerly on a completely new alignment between San Jose and Warm Springs. The first section to Trimble Road was completed in August, 1953, and the second section, 8.1 miles to Warm Springs, is scheduled for completion in the summer of 1954.

Posey Tube Overcrossings

The opening of the Alameda (Posey) Tube Overcrossings in Oakland February, 1954, marks the initial step in connecting the completed portions of the freeway with the San Francisco-Oakland Bay Bridge and with the Eastshore through Oakland, Berkeley and beyond.

Currently under construction are the third level additions to the Bay Bridge Distribution Structure and two adjoining sections along the Bay to the north. One, due for completion in July, 1954, falls within the limits between the distribution structure and Ashby Avenue, and the other continues this latter section to the Albany Overhead, to be completed next year.

Thus we have an unhampered flow of traffic through the congested 16-mile industrial section between Hayward and Oakland. The large volume of traffic formerly passing through the city streets of Oakland, San Leandro and Hayward which presently amounts ot a maximum of 65,000 vehicles per average day, now rolls through the open freeway in a matter of minutes.

Bayshore Freeway in San Francisco; Army Street interchange at bottom; Alemany Boulevard interchange, center; with section presently under construction between Alemany Boulevard and Third Street extending to upper left

View of construction progress on Bayshore Freeway in San Francisco from Third Street looking toward Alemany Boulevard

The Eastshore Freeway when completed will be 55.7 miles in length. Expenditures on this route for right-of-way acquisition and for construction of the 30.1 miles which are built or under contract, total $59,000,000.

US 101-GOLDEN GATE BRIDGE TO SANTA ROSA

Pressing toward the immediate goal of a through freeway from the Golden Gate Bridge to Santa Rosa, a major job on the Waldo Grade is now in progress, and a bridge with approaches at Petaluma Creek is well under way.

The first section was built as a controlled access facility, being completed in August of 1947. This $1,700,000 project provides for four lanes of divided highway covering the 12 miles between Petaluma and Ignacio. In 1949 the 4.3-mile Santa Rosa Bypass was completed as an expressway.

Late in September, 1952, a unit 5.4 miles in length between the Forbes Overhead and Ignacio was added to the previous section, making a continuous 17-mile run of limited access freeway from Forbes to Petaluma.

In October of 1953 one further step was taken in the transition to freeway. The six-lane divided highway between California Park and the San Rafael Viaduct was completed as a full freeway, with frontage roads, and an interchange structure at San Quentin Wye designed to serve the building San Rafael-Richmond Bridge. This section, together with the completion of the San Pedro Road undercrossing at Puerto Suello Hill, extends freeway continuity through the 22 miles between San Rafael and Petaluma.

Currently building, the four-mile section of full freeway between Golden Gate Bridge and Manzanita is scheduled for completion late in 1954 or early in 1955. The Golden Gate Bridge and Highway District is contributing $5,000,000 to this project. This six-lane facility involving a 1,000-foot tunnel, two side-hill structures each approximately 300 feet and four vehicular interchanges, will provide smooth flow for upwards of 30,000 per day load which traverses the grade.

Further progress toward Santa Rosa is indicated by the advertising for bids for the Petaluma-Stony Point job, an 8.2-mile section extending northerly from Petaluma Creek which includes four complete interchange structures. The outstanding feature of the job for which $4,713,000 has been budgeted, is the bypassing of traffic around Petaluma, whose citizens 20 years ago little dreamed that they would look toward this.

In Marin County another link in the freeway will be a new six-lane divided bridge across Richardson Bay for which $3,000,000 has been provided in the 1954-1955 budget by the California Highway Commission. Thus with a cost of $17,500,000 for sections already completed and under contract, a total in excess of $24,000,000 has been spent or obligated for this freeway.

BLACK POINT CUTOFF

Except for improved alignment through a hill at Black Point and another at Sears Point, this freeway follows the location of the original Black Point cutoff which was completed in 1918 to provide a direct route from the Bay area to Sonoma and Napa Valleys.

Extending from Ignacio to Sears Point, the grading has already been completed and the cut sections have been paved to eliminate the deficient portions of the alignment. At Sears Point a section 0.7 mile in length was completed in 1950 as a four-lane divided facility.

Finishing of the full facility which will require a new bridge across Petaluma Creek at Black Point as well as other structures and paving await the availability of funds. In the meanwhile, the embankments across marsh lands for the future additional lanes which were overloaded to accelerate settlement, have subsided approximately two feet. It is expected that further settlement will be only nominal, thus insuring a stable roadbed when final construction is undertaken.

The amount expended for right of way for this 7.3-mile freeway and for the initial work is $1,200,000.

View showing progress of grading operations for Skyline Boulevard from Edgemar Road to junction of Routes 55 and 56 in Daly City

UPPER Bayshore Freeway in San Mateo, looking south from vicinity of Third Avenue interchange. LOWER Bayshore Freeway through Burlingame, looking north from vicinity of Peninsular Avenue interchange.

NAPA AREA

The City of Napa is served by two major highways, one Sign Route 29, generally north and south, and Sign Route 37, generally east and west. Both routes traversed narrow and irregularly patterned streets in passing through the city. The impetus on traffic of the wartime activity at Mare Island necessitated the improvement of the route from Vallejo to Napa as an emergency measure. The most critical section was developed as an expressway in 1944 and the remaining portions were finished in 1949 to provide a continuous facility 12 miles in length through Napa County.

In September, 1950, two lanes constituting stage construction of a three-mile section of controlled access freeway was completed joining Routes 37 and 29 on an alignment westerly from the city. It is interesting to note that the 1953 count during 16 hours on Sunday, July 12th, shows 9,562 vehicles using the freeway. In the absence of this facility these vehicles would have saturated the streets of Napa, formerly included in the highway system.

To date $2,150,000 has been expended on stage construction of 14.6 miles of this rural type of expressway.

US 40-RICHMOND TO CARQUINEZ

This freeway has been laid out to bypass the built-up communities between Richmond and the Carquinez Bridge. Located generally easterly of existing US 40 on a more direct alignment the 13.8 miles which comprise this route is largely in the design stage. The planned improvement contemplates elimination of the sharp curve at the south end of the bridge and makes provision for a connection to a parallel structure which is proposed for construction 200 feet upstream from the present crossing.

At the Richmond end of the freeway, two structures for the initial unit are now being built, one over the Santa Fe tracks at 47th Street and one over San Pablo Creek. A contract to complete the 4.7-mile initial section is due for advertising this year, which will involve an expenditure of approximately $6,000,000.

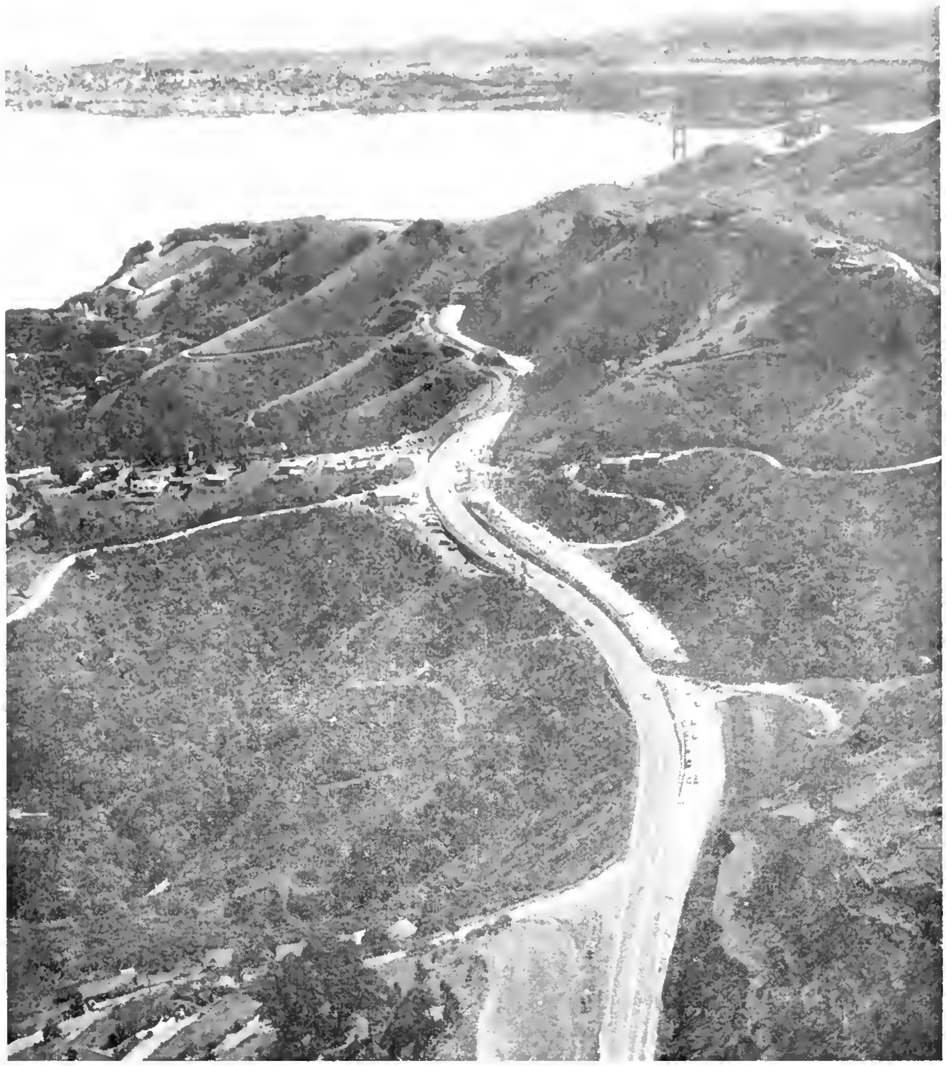
The cost of the structure contract and right of way that has already been acquired represents another $4,000,000.

ARNOLD INDUSTRIAL FREEWAY

The Arnold Industrial Highway in Contra Costa County, as an east-west thoroughfare which is signed as Route 4, originates in a junction with Route US 40 at Hercules. After traversing the low hills of western Contra Costa County it serves the industrial centers of Martinez, Port Chicago, Pittsburg, Antioch and proceeds easterly toward Stockton.

Its development as a freeway followed the dictates of the traffic pattern, the first section resolving the congestion in Willow Pass, where the vehicular flow from the south and from the west merges on its way to the industrial area and beyond. This original section was completed in 1947, its easterly limit being Port Chicago Road.

Similar construction, permitting controlled access, continued the freeway to Railroad Avenue in Pittsburg, this 4.5-mile section assuming a completely new alignment immediately south of the congested industrial area. Following this new alignment, a five-mile section which carries the freeway from Pittsburg to "A" Street in Antioch was opened July 1, 1953. The Barry Hill line change from Christie Underpass to Glen Frazer which was finished in 1949 completes the current development, which includes 13.8 miles of the 53.2 miles which have been declared a freeway. The expenditures for the finished sections of four-lane expressway total $5,800,000.



Construction operations showing widening of Waldo Grade, looking south toward Golden Gate Bridge

OAKLAND-WALNUT CREEK-CONCORD

The main approach to the East Bay metropolitan area is Sign Route 24. This facility, known as Tunnel Road from its passage through the Broadway Low Level Tunnel, carries a daily traffic load of over 38,000 vehicles. In addition to accumulating traffic from through easterly routes in Contra Costa and Alameda Counties, the

Redwood Highway looking north toward San Rafael from vicinity of California Park Wye

road serves a vast area of suburban population employed in the business and industrial centers of the East Bay.

The Tunnel Road, running easterly from the Broadway Tunnel and turning northerly at Walnut Creek to merge with the Arnold Highway, has been declared a freeway in its entirety. The present road has been confined by a strip development requiring practically complete realignment and an unusually large number of grade separations.

One section 2.3 miles long, from Concord to the Arnold Industrial Freeway, was completed in January, 1947. Work was recently assumed at Orinda Junction on a 1.2-mile unit, where Moraga Road makes a direct crossing of Route 24. This project which includes a complete interchange with a construction cost of $1,570,000 is scheduled for completion in May, 1955. While $2,700,000 has been spent for right of way, with considerable acquisition for future units, the construction of additional sections of the freeway awaits the availability of funds.

MOUNTAIN BOULEVARD

The improvement of Mountain Boulevard to freeway standards has been planned to provide better accessibility for the residents of a large section of Oakland lying on the west slope of the range which separates the Counties of Alameda and Contra Costa. The 9.3 miles which comprise the total length of this route from Lake Temescal to San Leandro are covered by freeway resolution.

A 1.4-mile section near Lake Temescal was completed in January, 1952, at a cost of $1,800,000 and an additional one-mile unit will soon be scheduled for construction.

Joint Highway District 26 was organized in 1938 to accomplish the construction of this road, with Alameda and Contra Costa Counties joining with the Division of Highways as members, and with the City of Oakland also participating in the cost. The annual contributions are made by these parties with 50 percent of the amount coming from state highway funds. The contributions for the 1953-1954 Fiscal Year totaled $900,000.

ALTAMONT PASS

The Altamont Pass Freeway is a part of Route US 50, one of the two primary east-west routes originating in District IV. While the start of this route is on the San Francisco approach to the Bay Bridge, only the portion lying easterly of Hayward has been declared a freeway. However, the continuity of an east-west freeway facility from the Bay area to the Central Valley will be accomplished with a link from the Eastshore Freeway at San Lorenzo which will connect with this route near Castro Valley.

The development of this highway into a freeway may be considered to antedate the Freeway Law of 1939. A four-lane divided highway replacing the old Altamont Pass between Greenville and Mountain House was completed in 1938. It reflects the thinking of the time, the completed

UPPER—Eastshore Freeway in Oakland, looking north from vicinity of 29th Avenue. LOWER—Recently completed Posey Tube overhead.

Engineers drawing of improved East Bay traffic distribution structure in Oakland. A third-level ramp is being built over existing traffic lanes connecting the San Francisco-Oakland Bay Bridge with MacArthur Boulevard. A curved ramp will be added from MacArthur Boulevard to the Eastshore Freeway. The improvements will double traffic capacity and are designed to eliminate cross-weaving traffic.

job carrying many features of present freeway design.

The second section, 5.8 miles from the foot of Altamont Pass to 1.5 miles west of Livermore, was completed in September, 1950. In addition to increasing the carrying capacity of the outmoded two-lane road, this four-lane section incorporates controlled access with frontage roads, and provides a channelized connection with State Route 108 from Livermore.

CASTRO VALLEY BY-PASS

Continuing westerly, a 5.9-mile section to Hopyard Road was completed in the summer of 1951, and another from Hopyard Road to 2.5 miles west of Dublin was opened in November, 1953.

Currently under construction and scheduled for completion in September, 1954, is the 2.1-mile Castro Valley Bypass from Crow Canyon to a point near the present Foothill Boulevard. From this point construction will soon start on the 2.6-mile connecting link to the Eastshore Freeway. Work is also in progress on the most easterly 1.7-mile section in Alameda County, which is included in a District X project terminating in Tracy.

Thus with the exception of a 5.3-mile section now in the design stage extending easterly from Crow Canyon Road toward Dublin, we have a virtually completed Freeway and Expressway from Oakland to the San Joaquin County line. Typical of the rise in traffic volume on Route US 50 through the long Livermore Valley section is the daily traffic count at Greenville; in 1939, 12,000 vehicles, and in 1953, 21,000 vehicles.

The total length of the Altamont Pass Freeway is 33.9 miles, and to date $17,700,000 has been spent or obligated for this facility.

PACHECO PASS

The Pacheco Pass Road, signed as Route 152, is the only connecting link between the Santa Clara and the San Joaquin Valleys. Now heavily traveled, it developed from a toll road, and later as a transcontinental stage road, into a vital artery of transport particularly with respect to industrial service.

Replacing the alignment of convenience as it took shape through the years, a 3.25-mile section of controlled access freeway from Cape Horn to the Merced County Line was completed in December, 1950. Sustained alignment and grade on either side of the summit, compatible with heavy vehicle travel, have replaced the former sharp curves and gradients as steep as 7 percent.

A two-mile unit extending westerly from Cape Horn which was previously constructed is included in the section covered by freeway resolution. The cost of improving the 5.7 miles leading to the summit of Pacheco Pass totaled $1,300,000.

US 101-EL CAMINO REAL

Two sections of freeway forming part of the Coast Route, US 101, in Santa Clara County, the San Jose Bypass and the Gilroy to Sargent project, were completed early in the postwar program.

UPPER—Eastshore Freeway near San Lorenzo; Washington Avenue interchange in foreground, looking north toward San Leandro and Oakland. LOWER—Southern terminus of Eastshore Freeway, showing connection to Bayshore Highway.

The two sections are considerable distance apart, funds then available limiting construction to the most critical areas.

Prior to the opening of the eight-mile bypass in June, 1947, all traffic in the Coast Highway passed through the heart of the San Jose business district. Here traffic from the Eastshore and Bayshore Highways merged on its way south, and likewise traffic from the south dispersed on its way northerly to San Francisco or Oakland.

Midcity congestion forced the building of a controlled access freeway immediately easterly from central San Jose. Continuing the Bayshore Extension which skirts the city, the freeway starts at the Santa Clara Street underpass, meeting the old Monterey Highway at Ford Road, eight miles southerly from San Jose.

It is interesting to note that upon its opening, traffic split evenly at Ford Road, one half using the old road into San Jose and one half using the bypass. On the succeeding years as the through traffic volume increased, substantial gains have been made on the new leg, thus sparing the city street from traffic in no manner connected with San Jose.

The Gilroy section, a 5.7-mile controlled access highway from Gilroy to a point 0.5 miles north of the San Benito County Line, was completed in February, 1951. This four-lane section was constructed in two units, partly as a widening of the Coast Highway, locally known as Monterey Road, and partly a new alignment. It forms an additional link in the ultimate El Camino Real Freeway presently signed as US 101.

The 14.4 miles which have been completed include all of the mileage which has been declared a freeway to date. The cost of developing these portions as a divided four-lane expressway was $4,100,000.

WATSONVILLE—SANTA CRUZ

As early as 1936 the Division of Highways began studies to determine the best means of providing adequate facilities for the growing volume of traffic between Watsonville and Santa Cruz. The first step in the development of a new route was the completion in 1942 of a three-lane highway, with four-lane transitions where needed, between Watsonville and Rob Roy. While no extensive provisions were made for the purchase of access rights, moderate success in controlled access was maintained with the help of the adjacent hilly terrain and persuasion against indiscriminate entrance. In consequence the facility provided a reasonable facsimile of freeway features.

The growth of Santa Cruz farming, industrial and resort area soon provided a demand for an extension of the improvement to include the Rob Roy-Santa Cruz section, and resulted in the completion of a controlled access freeway in November, 1949. The cost of this project, 7.7 miles in length, was $3,769,000 including construction and right of way, or $490,000 per mile, reflecting the effect of eight major structures required for railroad and vehicular crossings.

Construction on US 50 in Castro Valley; Castro Valley Boulevard, the existing highway route, is shown to the right of the direct alignment of the freeway bypass

LOS GATOS-SANTA CRUZ

The highway between San Jose and Santa Cruz, in addition to serving the agricultural area through which it travels, has been subject to sizable surges in its traffic pattern due to tourist and vacation traffic utilizing the extensive resort area. The route has undergone extensive stage development and is now entering a transition to controlled access freeway.

The route in its entirety has not yet been adopted as a freeway. Precipitated by the building of the Lexington Dam, a 1.8-mile section of freeway has been completed at a cost of $1,500,000 at a location south of Los Gatos which bypasses the dam site. Scheduled for advertising in the summer of 1954 is the Los Gatos Bypass which connects with the Lexington section and includes an interchange dividing Saratoga traffic and that en route to San Jose. The amount of $2,263,000 is included in the 1954-1955 budget for the construction of this project.

In the design stage as declared freeway with route adoption approved are the Los Gatos-San Jose section and the Scott Valley-Santa Cruz section.

SKYLINE BOULEVARD

The use of Skyline Boulevard as an entrance to San Francisco has grown with the development of the peninsula residential areas. Heavy grades and short radius curves have seriously reduced the utility of the road.

Currently under construction and scheduled for completion in September is a 2.3-mile section of freeway from Edgemar Road to Alemany Boulevard. This $1,000,000 project will facilitate funneling traffic into San Francisco dispersal routes. A connection from Skyline to the Coast Highway at Edgemar has been declared a freeway and is presently under design. This unit will provide a bypass for the Thornton Bluffs section on the coast alignment which is subject to severe punishment by the elements and from movement on the San Andreas fault which traverses this area. To the north, two additional units are scheduled for construction this year which will extend this facility to Lake Merced Boulevard in San Francisco. The amount budgeted for the 1.7 miles included in these two units is $1,092,000.

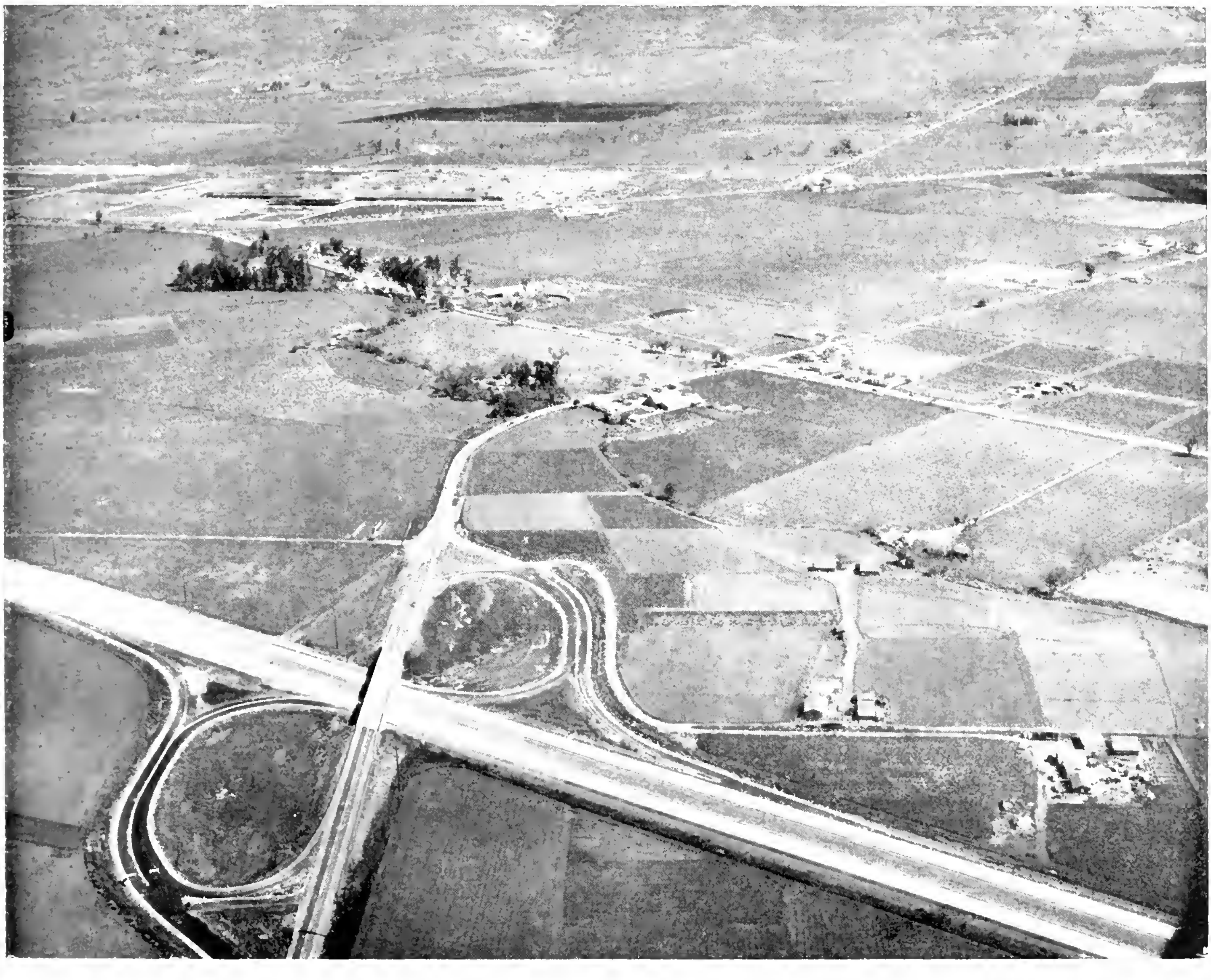
EMBARCADERO FREEWAY

Funds in the amount of $5,000,000 have been budgeted for the initial construction of the Embarcadero Freeway. The creation of this facility is an outstanding milestone in the development of transportation within the City of San Francisco. Crossing Market Street at the Ferry Building, it is the first freeway outlet offered to centers of employment, largely concentrated north of Market Street, connecting with the Bay Bridge and the peninsula.

Originating in the structure which connects the Bayshore Freeway with the Bay Bridge, the freeway proceeds generally parallel to Folsom Street, curving into the Embarcadero at Howard Street. Entirely an elevated structure in order to clear the approaches to piers and sheds, the planned units will run to Broadway, where ramps will come to grade at Sansome Street.

An eight-lane divided highway, the division is in a vertical plane rather than a horizontal. The lower deck will carry eastbound traffic toward the Embarcadero and thence northerly along the waterfront, while the

Trimble Road interchange on Eastshore Freeway. New Ford plant at Milpitas is visible to left of upper center.



upper deck will carry traffic in the opposite direction. This unusual construction, first of its type in the State, is, of course, predicated on space limitations.

Acquisition of right of way for the first one-mile unit is nearing completion at a cost in excess of $5,000,000.

PARK-PRESIDIO FREEWAY

The Park-Presidio Highway was built to provide an alternate route to the Golden Gate Bridge as well as to furnish a circumferential bypass from the western section of San Francisco and the Marina. While the planning of this facility predated the Freeway Law of 1939, when the 1.1-mile unit from Lake Street to the Golden Gate Bridge Approach was completed in 1940, it contained most of the essential features of a controlled access freeway, and provided an example for the people of the Bay area of what was to come in highway development. Built at a cost of $1,200,000 this four-lane facility has served well until recent congestion has made it necessary to commence planning for increasing its capacity.

Present studies include the improvement of all of the two-mile section

Davis Street interchange on Eastshore Freeway in San Leandro

STATUS OF DISTRICT IV FREEWAY PROJECTS

March 1, 1954

	Total miles	Completed projects		Under contract		Right-of-way costs
		Miles	Construction costs	Miles	Construction costs	
Bayshore Freeway; Bay Bridge to San Jose	48.8	14.4	$19,030,000	9.4	$18,259,000	$28,534,000
Eastshore Freeway; Richmond to San Jose	55.7	14.7	19,672,000	15.4	20,375,000	18,925,000
U. S. 101 Golden Gate Bridge to Santa Rosa	51.1	26.0	5,298,000	4.4	7,066,000	4,085,000
Black Point Cutoff; Ignacio to Sears Point	7.3	0.7	1,004,000			222,000
Napa area; Solano County Line to Union Station	22.4	14.6	1,441,000			712,000
U. S. 40 Richmond to Carquinez Bridge	13.8			0.1	388,000	3,500,000
Arnold Industrial Freeway; Hercules to Bridgehead Ave	53.2	13.8	4,400,000			1,358,000
Oakland to Arnold Industrial Freeway near Ohmer	19.4	2.3	226,000	1.2	1,570,000	2,700,000
Mountain Boulevard; Tunnel Freeway near Lake Temescal to San Leandro	9.3	1.1	1,297,000			540,000
Altamont Pass; San Lorenzo to San Joaquin County Line	33.9	22.6	4,720,000	3.8	2,374,000	6,263,000
Pacheco Pass; 1 Mi. east of Bell's Station to Merced County Line	5.3	5.3	1,285,000			20,000
El Camino Real Freeway; San Jose to San Benito County Line, portions	14.4	14.4	2,856,000			1,269,000
Watsonville Santa Cruz; Santa Cruz to Watsonville	15.3	7.7	2,740,000			1,029,000
Los Gatos Santa Cruz; San Jose to Santa Cruz	21.1	1.8	1,337,000			1,827,000
Skyline Boulevard; San Francisco County Line to Edgemar Road	3.4			2.2	640,000	593,000
Embarcadero Freeway; Bay Bridge to Broadway	1.5					5,450,000
Park-Presidio Freeway; Golden Gate Bridge to Fulton Street	2.0	1.1	1,172,000			50,000
Totals	377.9	140.5	$67,018,000	36.5	$50,672,000	$77,077,000

covered by freeway resolution from Fulton Street to the Marina approach to the Golden Gate Bridge.

CONCLUSION

In discussing the development of the various routes we have used the word freeway in a very general sense. Technically there are but two full freeways presently in the process of construction, the Bayshore and the Eastshore, these routes sustaining no crossings at grade.

Except for isolated sections built through expedience to the technical requirements of freeways, the remaining routes are expressways, built to freeway standards with the exception of permitted crossings at grade. They are so designed as to be converted to the higher standard when funds are available and where traffic warrants. However, the impact of the tremendous growth of the Bay region on highway transportation has made it necessary to plan initial construction as full freeways for nearly all of the projects in the metropolitan area which are now in the design stage.

Without going into details of an accident - per - million - vehicle - miles comparison, a recent survey showed a rate of 2.14 for full freeways and 3.41 for expressway types of construction. Since approximately 70 percent of all accidents occur at intersections it is evident that the true freeway with intersections at grade eliminated is the goal toward which we point. Since the tremendous cost of the full freeways restricts complete application of their desirable principles, we have of necessity limited them to the most critical areas. As funds become available and as the need becomes more pressing, our present expressways will undoubtedly enter a stage development toward full freeways.

Aerial photo of $1,500,000 freeway project at Orinda Crossroads, looking toward Lafayette, showing progress made to eliminate congestion. Point 1 marks wider Pine Grove turn for Lafayette-to-Orinda traffic. Point 2 shows part of underpass structure and side of Orinda Village-to-Moraga route under the highway. Point 3 marks widening of State Sign Route 24 to six lanes. Point 4 is site of cloverleaf ramp routing traffic from Orinda Village into Lafayette lanes.

HAZARDS ON STRAIGHT ROADS

The mere fact that a motorist is driving on a straight road is no surety against accident. The California State Automobile Association points out that 77 percent of all accidents occur on straight roads. Driving is a full-time job and anyone operating a motor vehicle should remain alert at all times.

STABILIZING LANDSLIDES

During the 1952-53 Fiscal Year the Division of Highways installed more than 23,000 lineal feet of horizontal drains as stabilization treatment of landslides and slipouts where the highways were being seriously affected. Development and improvement of horizontal drilling equipment made it possible to drill in areas considered impossible before.

Repair and painting of bridges and structures on the State Highway System cost a total of $592,849 during the 1952-53 Fiscal Year.

The Division of Highways spent $78,000 to control noxious weeds along the State's highways during the 1952-53 Fiscal Year.

Bay Bridge

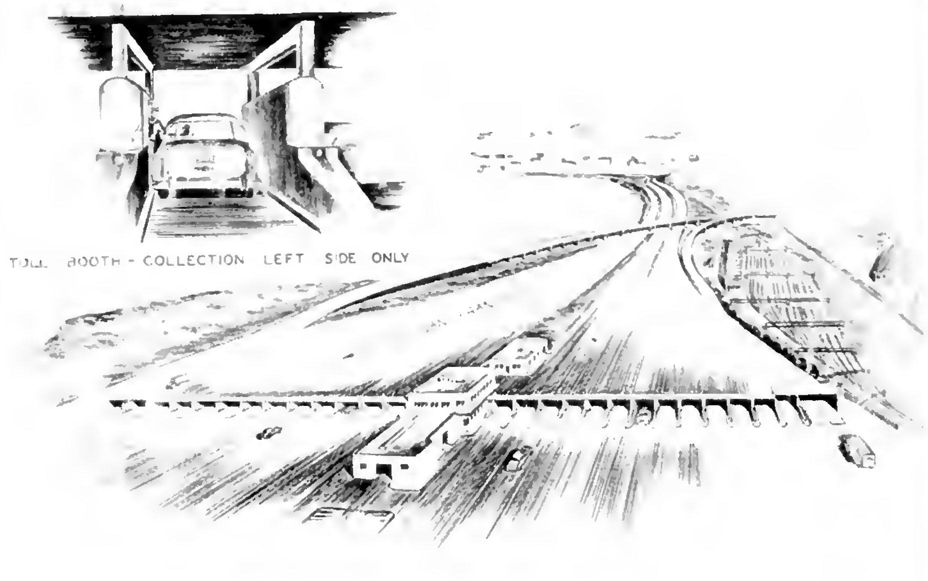
Improvements to Cost $4,000,000 Are Planned

Plans and specifications are virtually completed for improvements to the San Francisco-Oakland Bay Bridge which will help alleviate congestion, increase safety and speed up collection of tolls.

The work is expected to cost approximately $4,000,000, and will be financed out of bonds already issued by the California Toll Bridge Authority.

The improvements have been organized into five projects, the first three of which are due to be advertised for bids during the next three months. They are:

1. Revision of four connections to Yerba Buena and Treasure Islands.
2. Lane control signals on the lower deck.
3. Dredging and drainage structures for the widening of the toll plaza and its approaches north of the administration building and to provide for extension of the overhead structure carrying traffic to and from the Port of Oakland.



PROPOSED TOLL GATES

Port of Oakland Overhead

The two remaining contracts will cover the surfacing of the new toll lanes and alteration of the Port of Oakland overhead; and the revision of the existing toll lanes south of the administration building to provide for driver's-side-only collections.

Revision of the island connections will consist for the most part of easing the turns to and from the island ramps.

Automobiles entering Yerba Buena Island from the upper deck of the bridge must now slow down almost to a stop to make the right-angle turn The new connections will permit island-bound cars to pull out of the main stream of bridge traffic and make their turns at normal speed.

Automobiles entering the bridge from the island will be able to merge into the traffic stream by means of an acceleration lane instead of having to enter at a right angle and from a full stop.

On the lower deck, trucks and buses turning from the bridge onto the island will no longer have to swing wide, as they do at present, to avoid columns and other obstructions. These obstacles will be removed and the entrance widened.

Intersection Revision

The connections to the island were designed nearly 20 years ago. Two of the ramps were intended only for temporary use, to serve the World's Fair of 1939-40. The development of Treasure Island as a naval base made these temporary connections permanent, and the heavy postwar increase in the volume of traffic on the bridge has made revision of the intersections imperative.

The traffic signal system for the three-lane lower deck will expedite the flow of traffic by providing two lanes in one direction whenever called for by emergencies or periods of temporary congestion.

The installation will consist of signal heads placed at about 600-foot intervals above each traffic lane the entire length of the lower deck. It is believed this system will be the longest and most complete of its kind in the world.

New System of Signals

An operator seated at a master switch panel in the administration building can change the signals at any time to conform to traffic conditions on any part of the lower deck, including emergency conditions as radioed or telephoned in by patrolmen or maintenance workers.

The signal system of lane control, by providing maximum flexibility in the routing of traffic, would also prove valuable in the event of any conditions making it necessary to use the lower deck for automobile traffic. During the Key System strike of 1953, when the lower deck was used by automobiles during peak periods, the adjustment of lane assignments had to be handled manually by bridge employees, placing and shifting portable signs and dividers.

. . . Continued on page 46

Artist's sketch superimposed on aerial photograph shows the three ramp connections between the upper deck of the San Francisco-Oakland Bay Bridge and Yerba Buena and Treasure Islands which will be improved to provide easier turns. A connection on the lower deck will also be improved.

Pier Construction

Rapid Progress on Richmond-San Rafael Bridge Project

By NORMAN A. RAAB, Projects Engineer, Division of San Francisco Bay Toll Crossings

In the November-December, 1953, issue of *California Highways and Public Works* an account was given of the early history and a general description of the work now in progress on the Richmond-San Rafael Bridge.

Since this writing, 2 of the 15 contracts to be awarded during the construction of this project have been completed, four are in various stages of completion and the other nine contracts are now being advertised for bids or awaiting the proper time for advertising.

Of the construction now in progress, probably the most interesting is the pier work being performed by the joint contracting venture, Ben C. Gerwick, Inc., and Peter Kiewit Sons' Co., under the contract for the substructure. The bid for this work amounted to $14,500,000 and at present writing is 45 percent complete.

79 Substructure Piers

The substructure contract provides for the construction of 79 piers of reinforced concrete supported on steel H-piles to provide the foundations for the structural steel portion of the bridge crossing. During construction in the vicinity of Castro Rocks, bedrock was uncovered at higher elevations than indicated by the foundation explorations. It was necessary to raise the bottom elevations of bell piers Nos. 56 and 57.

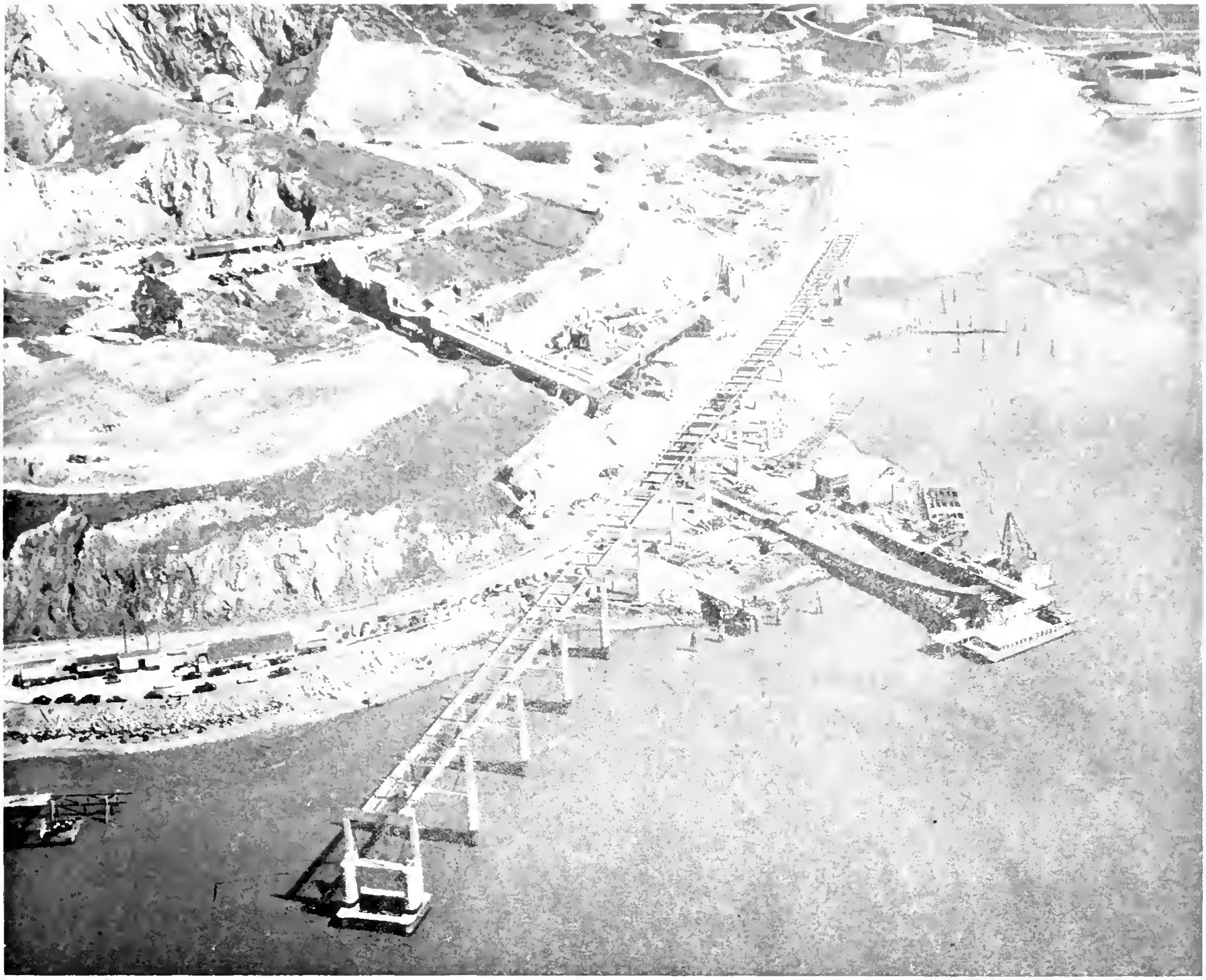
All of the piers are of the same general class in that they are designed to be supported on steel H-piles driven to required bearing in hard strata, such as bedrock, or compacted sands and gravels. However, the methods of constructing the piers, for the conditions existing at the site, vary widely and may be classified as to construction under the headings of land piers; shallow water, or cofferdam piers; and bell-type piers for use where water and great depths of soft clay and silts overlie the firm materials.

Of the 79 piers, nine are built on land, eight are built in cofferdams in the shallow waters near the eastern bridge terminus, and the remaining 62 are of special construction for the bell-type pier designs.

Ready to Receive Steel

As of this period, the nine piers constructed on land and the eight cofferdam piers on the Richmond end of the contract have been completed. Several of the bell-type piers are now ready to receive steel and others on the west end of the bridge are nearing completion.

Trestle approach, Marin County. Trestle connecting present Richmond-San Rafael Ferry pier with permanent construction.



Completed piers Nos. 61-78 with start of steel construction, Contra Costa County

Specifications provided that the contractor develop and construct such stable temporary structures, or other devices, as would enable the engineer to establish thereon controlling centerlines and grades for the location and control of pier construction. The first of these control towers for the bell piers was placed opposite Pier No. 45 on April 14, 1953.

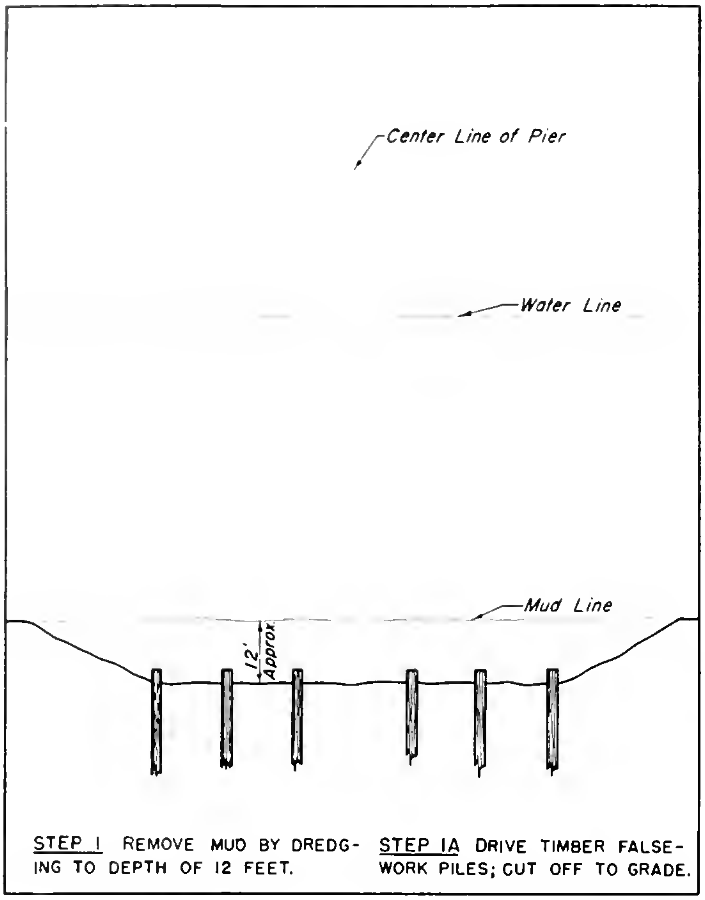
The contractor's procedure for substructure work was predicated on the plan that materials and equipment were immediately available to construct the land and the cofferdam piers and that special equipment and methods would be required for constructing the bell-type piers. Construction of land and cofferdam piers began soon after the contract was awarded on February 26, 1953, which advanced the scheduled construction by almost six months.

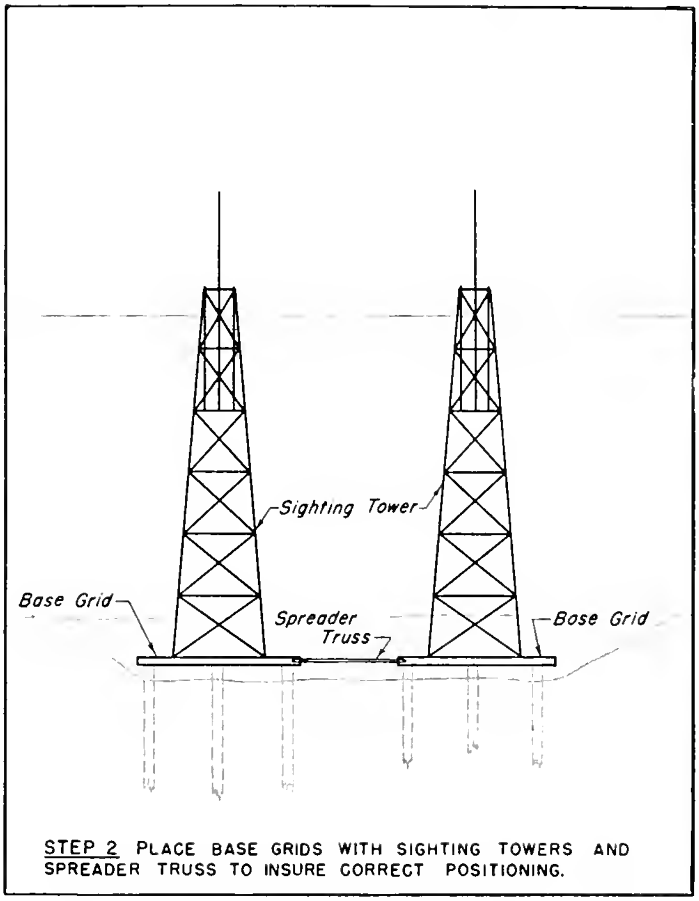
Bell-type Pier Designs

For the bell-type pier designs, the contractor elected, generally, to use precast concrete shell sections in lieu of steel plate reinforced with angle sections previously used for similar piers on several large eastern bridge projects. Completion schedules were established to come within the specified time allowances.

The contractor's choice of construction methods for the bell-type pier designs was further predicated on: (1) fabrication of the pre-cast concrete shell sections in his Petaluma casting yard with planned barge delivery of elements to the bridge site; (2) construction of special floating equipment such as pile drivers, derricks, and a concrete plant for concrete placement at the site; and (3) shipment of steel H-piles from eastern mills to the yard of Gilmore Fabricators, Inc., Oakland, where they are spliced to proper lengths and barged to the site for driving.

Since most of the foundation cost and equipment requirements are for the bell-type piers, their construction





See photo below

is summarized in the following steps shown on accompanying drawings:

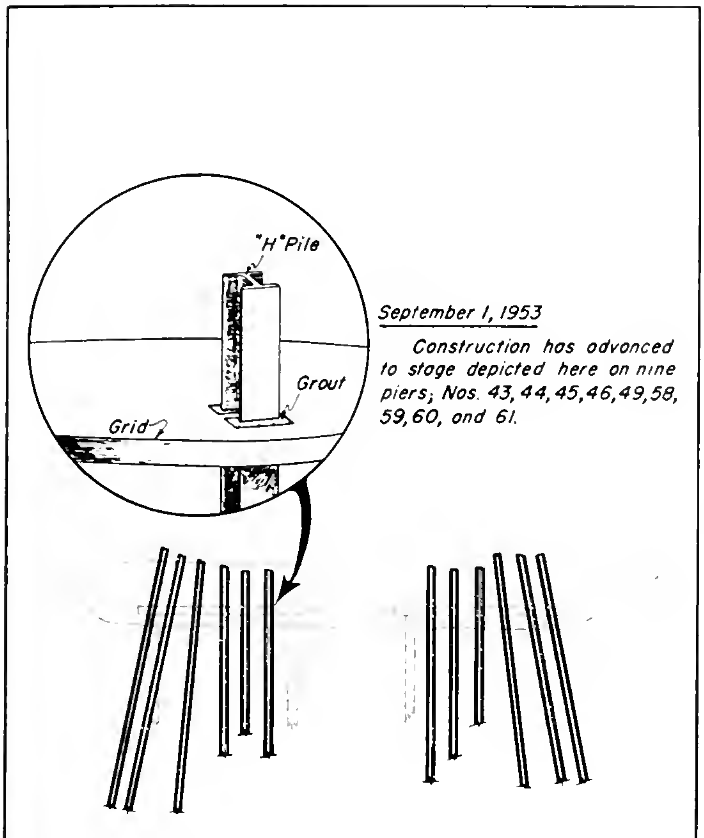
Various Steps

1. The soft material below the mud surface is excavated to a depth of approximately 12 feet at the site of the pier. Timber piles are then driven and the tops cut off, by an underwater saw, to an exact predetermined elevation ready to receive and support a precast concrete mat, or base grid, and the construction loads imposed thereon.

2. Each concrete mat is one foot in thickness, slightly larger in diameter than the base of the pier for which it is designed, and has cast in H-shaped slots to locate steel H-piles. The slots are in a geometric pattern and the number of piles in each varies according to type and location of the piers. The mat is placed by a derrick barge and is lowered by a cage with a centering mast. Survey controls to this mast serve in accurately placing the mat in its proper location.

3. The 14-inch 89-pound steel H-piles are threaded through the slots by divers and then driven to the required bearing

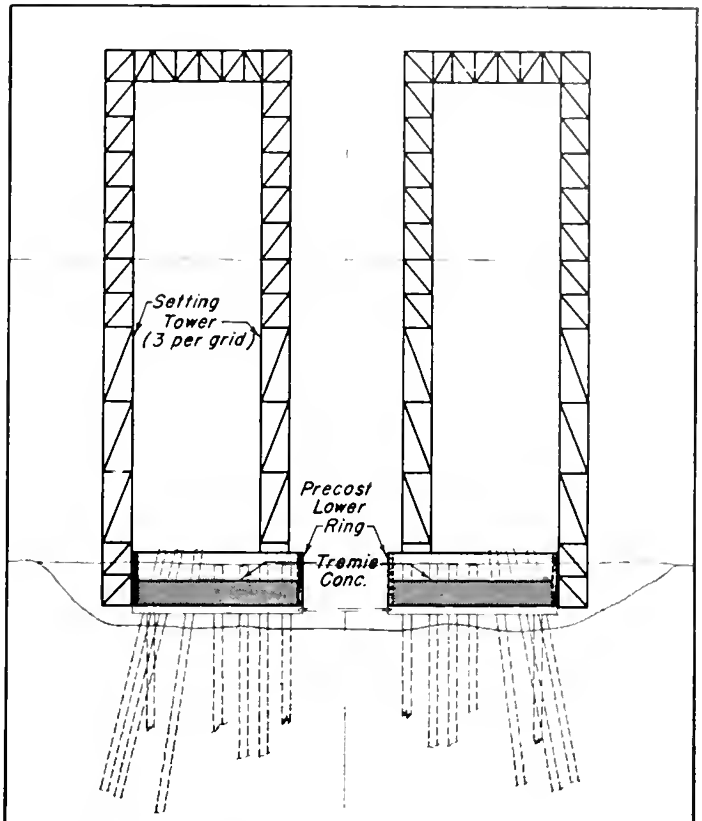
STEP 2—Precast base grid for Pier 54 in place on barge for transportation to bridge location



September 1, 1953

Construction has advanced to stage depicted here on nine piers; Nos. 43, 44, 45, 46, 49, 58, 59, 60, and 61.

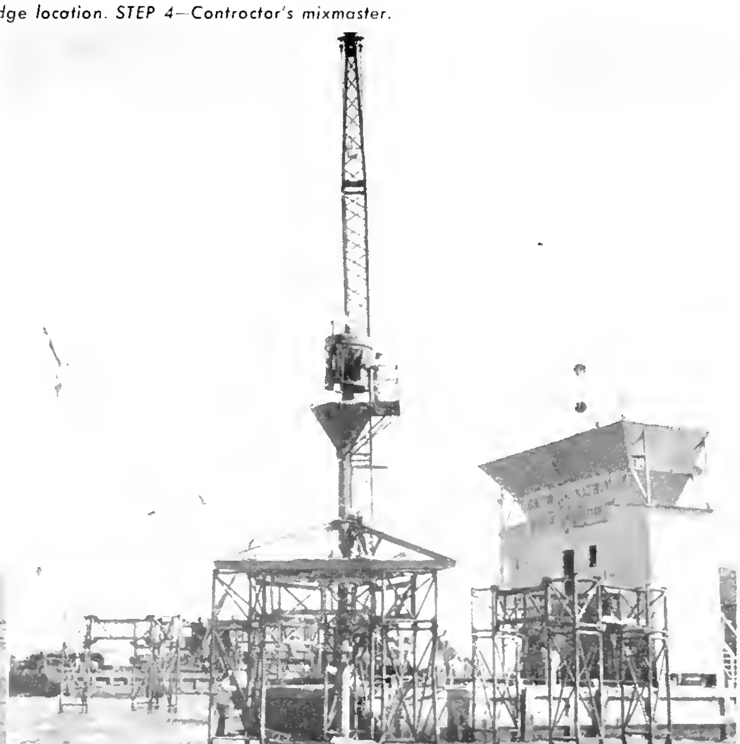
STEP 3 DRIVE STEEL H PILES AND GROUT TO GRID.

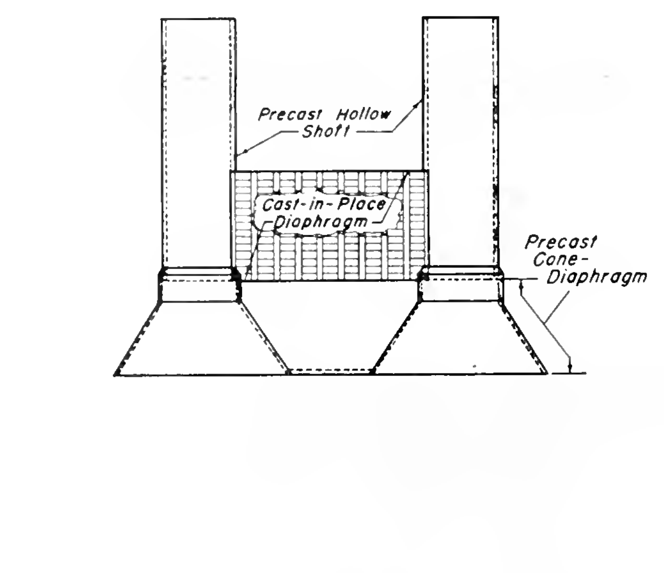


STEP 4 SET LOWER RING WITH SETTING TOWERS AND POUR 5 FOOT LIFT OF TREMIE CONCRETE.

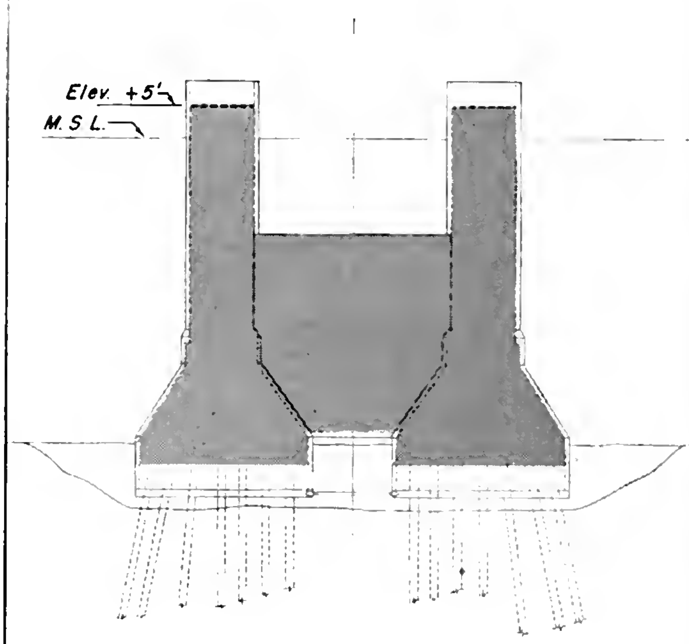
See photos below

STEP 3—Pile driver in operation on bridge location. STEP 4—Contractor's mixmaster.

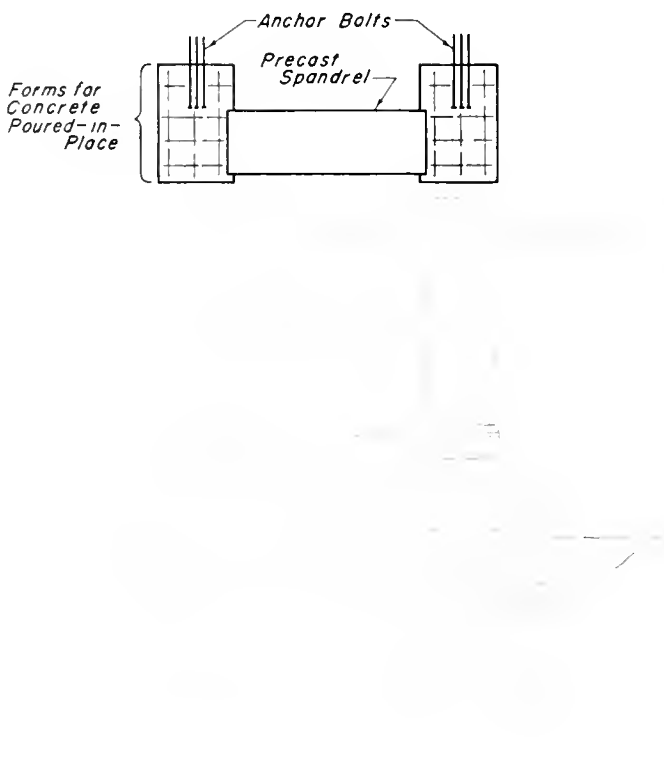




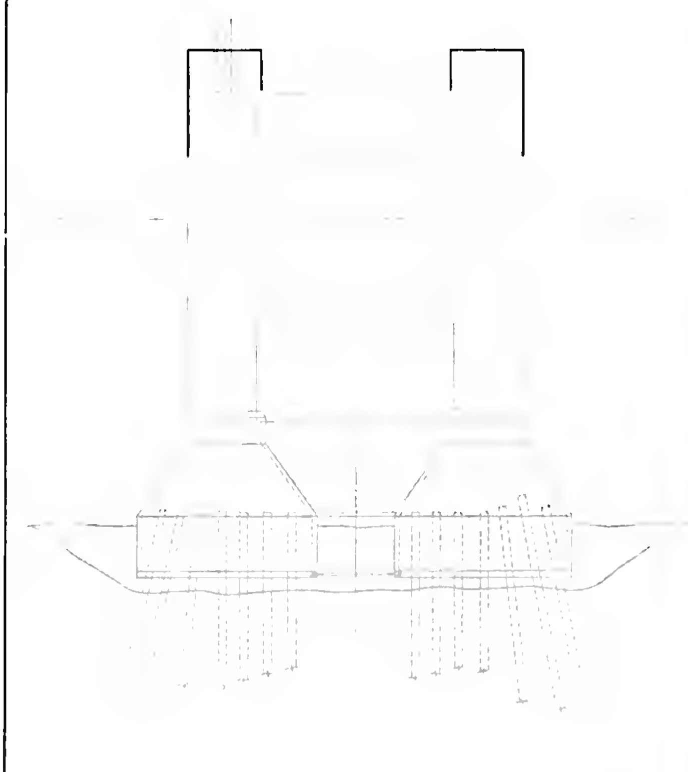
STEP 5 SET PRECAST CONE-DIAPHRAGM UNIT; SET PRECAST HOLLOW SHAFTS; PLACE FORMS FOR CAST-IN-PLACE DIAPHRAGM.



STEP 6 POUR TREMIE CONCRETE TO ELEVATION +5 FT.

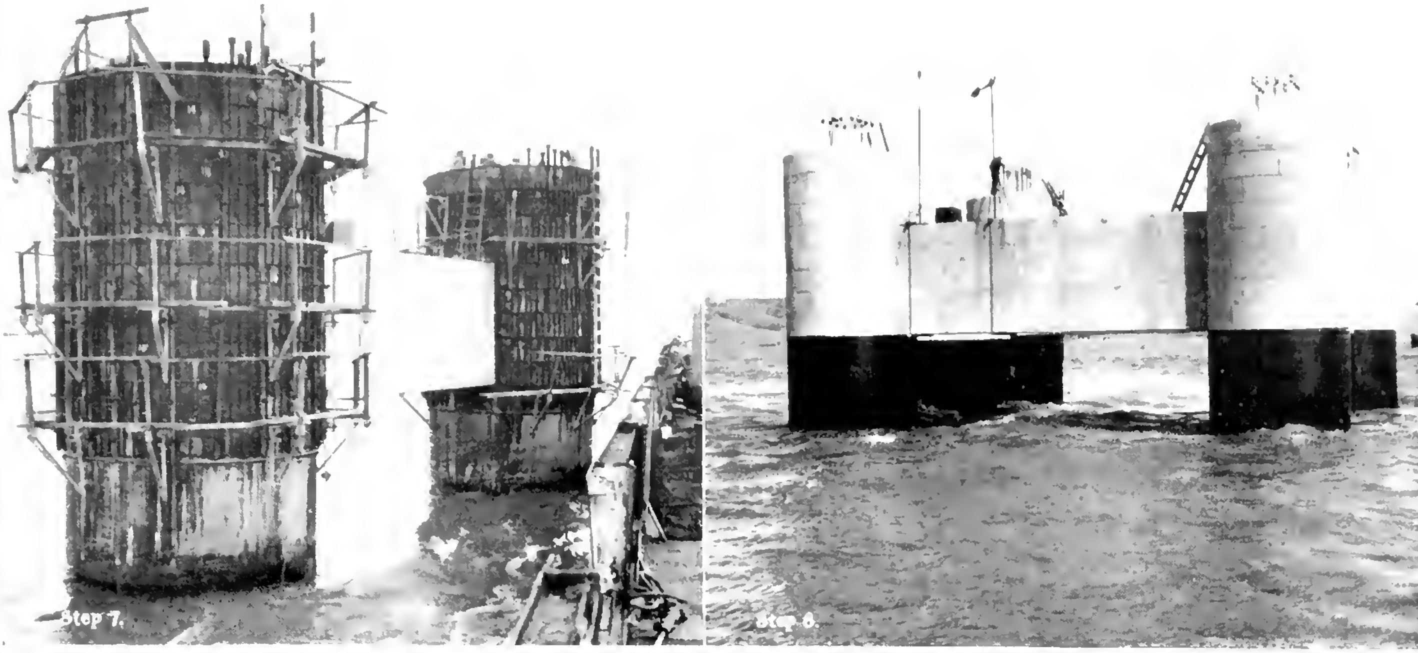


STEP 7 PLACE PRECAST SPANDREL; ERECT FORMS FOR SHAFT TOPS; PLACE ANCHOR BOLTS.



STEP 8 POUR CONCRETE TO FINAL ELEVATION; STRIP FORMS AND CURE. COMPLETED PIER.

See photos page 25



STEP 7—Form barge preparing for final concrete pour on Pier 46. STEP 8—Deep-water four-bell pier, Pier 44.

in hard strata. After piles are driven, they are sealed in the grid slots by grout placed by divers.

4. The lower ring sections of the reinforced precast concrete shell is lowered onto the grid by a derrick barge utilizing a triangular-shaped lifting and setting tower. The shell is centered by steel guides cast into the grid. After the shell is leveled, any open spaces between the shell and the grid are sealed. Then the grid, interior cylinder section walls, and pile surfaces are cleaned of all foreign material, and a five-foot lift of tremie concrete is placed to support further construction and design loads. The tremie concrete placement operation includes the lowering of large tremie pipes through the shafts until their lower ends bear on the grid; and their tops, each with an attached funnel or hopper for fresh concrete, extend above water. These tremie pipes are then filled with concrete

. . . Continued on page 32

RICHARDSON BAY BRIDGE PLANS COMPLETED

Bids for constructing a new six-lane bridge to carry US 101, the Redwood Highway, across Richardson Bay in Marin County will be called for within the next three months, it was announced by State Director of Public Works Frank B. Durkee.

The new 2,800-foot span will be located east of the present bridge. Construction will be financed by a $3,000,000 allocation in the state highway budget for the 1954-55 Fiscal Year, and will take an estimated two years to complete.

The present bridge, a four-lane timber pile trestle built in 1931, will remain in service until the new bridge is finished. It has a 40-foot lift span to handle navigation.

The highway over the new structure will be 86 feet wide from curb to curb and will have a 10-foot dividing strip down the center between the two three-lane roadways. The northern section, over open water, will be of prestressed concrete girder construction. The southern section, over the road to Mill Valley and the Northwestern Pacific Railroad tracks, will be of reinforced concrete box girders.

The bridge will provide vertical clearance of 35 feet above high water for navigation in and out of the bay, without stoppage of highway traffic. Horizontal clearance will be 56 feet.

When construction of a new Richardson Bay highway crossing first came under consideration, the possibility of building an earth fill rather than a bridge was investigated. The choice of a bridge was dictated by geological factors and other requirements, according to Division of Highways engineers.

The mud and muck at the bottom of Richardson Bay are very unstable and wholly unsuitable for a highway fill foundation, according to engineers of the Division of Highways. In some spots the unstable material is 100 feet deep. Construction of a fill would require removal of all of this mud and replacing it with sand or other stable material, at great expense.

Engineers also point out that the permit issued to the State by the Department of the Army specifies that any structure crossing Richardson Bay must have a vertical clearance of at least 35 feet. A fill would therefore require locks and drainage structures to provide for navigation, which are costly both to construct and to maintain.

The new bridge, for which plans and specifications are nearly complete, complies with all requirements of the Army.

THE EFFICIENT SELECTION OF A CALCULATING MACHINE

By G. G. McGINNESS, Acting Engineer, Service of Supply

In the past five years, the Service and Supply Department has procured for the California Division of Highways 438 calculating machines at a cost of almost $180,000.

The need for calculators is rarely disputed but there is sometimes a difference of opinion on which make and model should be purchased. Controversies arise regarding the necessity of special features and gadgets. With so much money involved in purchase price, and a great deal more for salaries of operators, it is almost imperative that a thorough engineering analysis be the basis for selection.

If the prospective buyer and user of a calculating machine was thoroughly familiar with all the makes, models, and special features of the machines available, and if he knew all of the problems the machine would be called upon to figure in the next 10 or 20 years, he would be able to select the best model for the job with little effort.

Selection of Efficient Machine

No man, however, is so fortunate as to possess all of this knowledge. He must have help. The user knows what his present problems are and he should have a very good idea of what his problems will be in the future.

Good sales representatives know what their machines will do. The two must work together in the selection of the most efficient machine.

The prospective buyer should prepare a complete example of each problem that the machine will be expected to figure repeatedly over a period of years. These examples he should submit to the sales representatives of the various makes of machines who in turn will work the problems on their several models, detailing procedures, until they find the model and procedures which will handle the majority of the problems most efficiently.

When this has been done, the sales representative should submit to the user a proposal fully describing the machine, stating its price, and giving a step by step outline of the procedure for figuring each problem.

Tests Must Be Made

The user should then borrow one of each of the proposed machines and place them in actual use for two or three weeks to test the proposed figuring procedures, make time studies, and observe incidental features of the machines.

Incidental features to be considered are ease of operation, size of machine, quietness, and availability of service.

The highest priced fully automatic electric machine might prove to be most efficient as it should last 20 years and cost about 30 cents per working day, including regular maintenance, but there are many cases where the lowest priced hand machine costing 10 cents per working day will do the necessary work even more efficiently.

If the prospective buyer and user of a calculating machine does a good job in the preparation of examples and follows up with a thorough testing of machines and procedures, he cannot fail to make a good investment. The sales representatives must prepare their proposals accurately as they are in competition and any carelessness on their part would in all probability result in the loss of a sale.

Clearing House

Service and supply engineers of the California Division of Highways have urged the use of this method of selection for many years and they believe that machines purchased for the Division of Highways are the most efficient and economical for the intended use.

Corollary to the efficient selection of a calculating machine, the detailed procedure for figuring each problem will serve as an instruction sheet for new operators. With step by step instructions, a new operator should be calculating efficiently with a minimum of time and supervisory effort expended.

It is quite probable that a person figuring on a machine day after day will discover new and better procedures or short cuts in adopted procedures. Such improvements in methods should be passed on to other operators to improve their efficiency. For this purpose, the Headquarters Service and Supply Department is willing to act as a clearing house for the Division of Highways and will disseminate this information throughout the division.

STREET LIGHTING SESSION

A conference on street lighting will be held in San Francisco Tuesday morning, April 20th, as a parallel session to the eighth annual regional conference of the South Pacific Coast region of the Illuminating Engineering Society. A demonstration of street lighting research problems at the University of California's field test laboratory at Richmond the same evening will be a second event of special interest to all who are concerned with traffic lighting problems.

The regional lighting conference will open at 9 a.m. on Monday, April 19th, at the San Francisco Museum of Art, under the joint sponsorship of the Northern California Section of the I. E. S. and the Northern California Chapter of the American Institute of Architects. The two-day program will be devoted to lighting as an element in architecture and interior design. Numerous nationally-known speakers from the East are expected to attract attendance from many parts of the region, which includes California, Nevada and Hawaii. The parallel session on street lighting the next day will open at 9 a.m. at the Western Merchandise Mart.

Cooperation

Bay Area Meets Traffic Crisis on San Francisco-Oakland Bay Bridge

By B. J. TALVACCHIA, Traffic Engineer, San Francisco-Oakland Bay Bridge

Operation Cooperation might be considered an appropriate term to describe the 11-week period of unusual traffic conditions on the San Francisco-Oakland Bay Bridge during the 1953 Key System strike. This article is an account of how the driving public and the traffic authorities of an entire metropolitan community banded together to enhance traffic safety and expedite the movement of peak-hour traffic during a transportation emergency.

Cooperation by Public

Cooperation by the driving public and among public agencies in the Bay area always has been an important factor in meeting the normal traffic problems on the Bay Bridge in the past, just as in any metropolitan area in the State, or Nation, where existing facilities are carrying an overburden of vehicles beyond their practical capacities. However, the cooperative movement during the strike is noteworthy for the unusual amount of coordinated effort contributed by the several agencies directly connected with handling bridge traffic, together with the excellent assistance supplied by the driving public.

Vehicular traffic on the bridge during this period increased with a sudden impact due to the public transit shutdown affecting about 54,000 passengers per day normally using the transbay train and bus facilities of the Key System Transit Lines. Inasmuch as the bridge vehicular capacity is overtaxed under normal conditions, potential congestion of traffic under these abnormal circumstances presented a problem of major proportions.

Advance Plans

Plans began to take shape to meet the anticipated problem about a month prior to the beginning of the strike. As early as June 26, 1953, when Key System employees threatened to walk out, a meeting was held at the Bay Bridge office, attended by representatives of the California Highway Patrol, San Francisco City Police, and the Bay Bridge staff. In general the experience gained during the strike of 1947 served as a guide, and the meeting succeeded in laying the groundwork for coordination among the organizations present in the event that the strike did occur.

When the decision to strike was announced a few days prior to the effective date, another meeting was held in San Francisco at which time plans were completed in order to meet the anticipated transportation emergency. Other organizations contacted prior to the beginning of the strike included the City of Oakland Police Department, military authorities at U. S. Naval Station on Treasure Island and the Oakland Army Base, and Bay area trucking and draying associations. In addition, press releases were sent out to the major Bay area newspapers, radio and television stations, all of whom willingly served to contact the driving public. These organizations joined together in coordinating activities involving bridge traffic during the strike in order to minimize bridge traffic congestion.

Some Statistics

Statistical records of bridge traffic during the strike, when compared to a similar period of the previous year, reflect the amount of public cooperation and the favorable results obtained throughout the strike period. Some of the more significant statistics are listed below:

	Non-strike period 7/25 to 10/10/52	Strike period 7/24 to 10/9/53	Percent change
Traffic			
Total traffic	6,809,373	7,467,503	+ 9.7
Daily average	87,300	95,737	
Number of passengers per car	1.7	2.0	
Accidents			
Total accident rate per MVM*	2.68	2.08	— 22.4
Property damage only per MVM	2.08	1.55	— 25.5

	Non-strike period 7/25 to 10/10/52	Strike period 7/24 to 10/9/53	Percent change
Personal injury rate per MVM	0.58	0.53	— 8.6
Fatal accident rate per 100 MVM	2.51	0	—100.0
Emergency Services			
Number of vehicles serviced	2,130	2,271	+ 6.6
Daily average	27.3	29.1	
Number of vehicles crossing bridge per vehicle serviced	3,197	3,288	+ 2.9

* MVM = million vehicle miles.

No Major Traffic Jams

The strike began at 12.01 a.m. on Friday, July 24, 1953. Over 100,000 vehicles crossed the bridge on the first day and traffic moved with little or no delay, even during the morning and afternoon peak periods. The first week the average daily traffic was up to 93,000, or approximately 6,000 vehicles above normal. The heavy traffic failed to develop any major traffic jams on the bridge proper and delays to commuters were few during the first week. Traffic flow, especially on the San Francisco approach ramps, was noticeably smoother than normal.

During the second week the average daily traffic jumped to 94,000, the third week to 96,000. Bridge traffic continued to move with surprisingly little delay. By the end of the eighth week the average daily traffic had soared to 98,500 vehicles. And, by eliminating the week-end totals, the average weekday traffic during the eighth week had reached 102,815 vehicles per weekday.

The ninth week began on Friday, September 18th, with 109,035 vehicles crossing the span, thereby establishing a record high volume for a 24-hour period throughout the 17-year history of bridge traffic. A few days later, on September 23d, the sixty-second day of the strike, the Department of Public Works' staff photographer was on hand to snap a series of aerial photos showing traffic moving along the bridge roadway relatively free of congestion. On this sixty-second day, the official count for the 24-hour period was 100,148. Peak-hour traffic was close to 10,000 vehicles per hour in both directions.

Six Factors

There were at least six factors which contributed to the safe and expeditious movement of bridge traffic, especially during peak hours:

1. Careful, courteous, and comparatively stall-free driving.
2. Spreading of normal commuter (peak-hour) traffic over a longer period on a voluntary basis.
3. Absence of commute busses on the lower deck.
4. Change in the normal pattern of truck traffic on the lower deck.
5. Car pooling.
6. Additional man power directing traffic in the areas immediately adjacent to bridge approaches on both sides of the bay and at strategic locations along the bridge roadway.

A remarkable degree of cooperation by the driving public under emergency conditions is indicated by an analysis of the statistical data, which shows a higher ratio of the vehicles crossing the bridge to vehicles requiring emergency service during the strike, in addition to a lower accident rate. The reduced accident rate is especially significant since the accident frequency decreased in spite of the substantial increase in traffic volume.

U. S. Navy Assists

Spreading of normal commute traffic, which made bridge space available for the additional automobiles required to transport the extra passenger load on the upper deck, was very helpful. For example, the U. S. Naval Station at Treasure Island changed employees' working schedule by one hour. The result was that several hundred cars which normally cross the bridge between 7.30 and 8 a.m. westbound, and 4.30 to 5 p.m. eastbound, actually cleared the Toll Plaza prior to 7 a.m. westbound, and before 4 p.m. eastbound, beginning with the first day of the strike.

Diversion of automobiles to the lower deck helped greatly in the handling of traffic during morning and afternoon peak periods. The success of this diversion was substantially assisted by the absence of the normal load of Key System busses and by the voluntary reduction of truck traffic during the peak traffic periods. A passenger count taken at the Toll Plaza by the bridge management indicated that, on an average, approximately one extra passenger was carried by every third car. This was in addition to the passengers usually carried by automobiles. Some passengers reverted to the use of Southern Pacific ferries to cross the bay.

Police Control Traffic

Traffic police in San Francisco and Oakland were concentrated in areas adjacent to bridge ramps to control and direct traffic approaching and leaving the bridge. They helped to reduce, and often to eliminate, many bottlenecks which normally occur in the areas adjacent to the bridge approaches on both sides of the Bay. The Highway Patrol, in charge of the policing of the bridge and the East Shore Freeway, assigned personnel to maintain a maximum of cooperation with traffic police on both sides of the Bay.

Results of the combined efforts for the full strike period are indicated by the pictorial record shown on these pages. To be sure, there were many instances of minor congestion and even some major traffic jams during the 11 weeks of the strike. Generally, however, weekday peak traffic crossed the bridge with few delays that might be considered objectionable in the circumstances. And, of greater importance, the accident frequency continued at, or below, the favorable level existing prior to the strike.

Close-up of Toll Plaza looking easterly. Note the idle railway rolling stock in storage yard adjacent to toll gates. Vehicular traffic passed through the toll gates in record numbers. The toll collection staff did a remarkable job under difficult circumstances as evidenced by the fact that collectors handled daily, during peak hours, as many as 12 cars per minute, or one car every five seconds.

Close-up of the San Francisco ramp system looking southerly. In the center foreground, automobile traffic in the San Francisco city streets is being partially diverted to the lower deck (truck level) by the San Francisco city police. The absence of Key System buses, which normally use the lower deck, assisted materially in making it possible to divert a substantial amount of upper-deck traffic to the truck level, thereby relieving the potential bottleneck at the merging point of upper-deck ramps shown at center righthand portion of picture.

This interesting phase of San Francisco-Oakland Bay Bridge traffic history is a tribute to the cooperative spirit that was displayed in the Bay area. It can be appropriately designated "Operation Cooperation."

LEBANON INTERESTED

BEIRUT, LEBANON
March 15, 1954

MR. KENNETH C. ADAMS, *Editor*

DEAR SIR, With great interest, I ran through your last January-February issue of *California Highways and Public Works*, the first number of that magazine I had the pleasure to discover during my short stay in Turkey on an official mission developing highway construction and maintenance.

It will be very much appreciated if you will be so kind as to put my name on your mailing list and send me, at home to the undermentioned address, that January-February issue and the future publications which I hope will be of great value to my country, the Lebanon.

Sincerely yours,

M. A. ITANI, Engineer
Ministry of Public Works
Beirut, Lebanon

Maintenance forces of the Division of Highways straightened or erected 12,500 signs and cleaned or washed 27,746 during the 1952-53 Fiscal Year. The increasing volume of work of this type required development of a sign washing machine.

Initial Link of Sacramento-Lodi Freeway Planned

THE STATE Division of Highways has announced it expects to advertise in late spring for bids on the first stage of construction of a five-mile section of four-lane freeway on US 50-99 between Sacramento and Lodi.

Building of this section, extending along the existing highway between one-half mile south of Elk Grove Road and two miles south of Florin Road, will be the first step in the proposed development of US 50-99 between Lodi and Sacramento as a full freeway of four lanes, with provision for an ultimate six lanes.

An item of $1,000,000 is set up in the 1954-55 State Highway Budget to start construction on the five-mile section. The work which will be under way this summer includes the separation structures, the drainage structures and grading incidental to the structures. Some frontage road grading and paving will be performed preparatory to a second contract, not yet budgeted, which will include the main grading and paving.

As the freeway is developed, frontage roads will be constructed along both sides of the highway to connect with overhead structures which will carry cross-traffic. The frontage roads will provide complete access to adjoining lands.

The unit on which construction is scheduled is south of the proposed South Sacramento Freeway, most of which is planned for an initial six lanes beginning at Elsie-Mack Road, 2.2 miles south of Florin Road.

Plans of the Division of Highways now call for ultimate development of US 50-99 as a full freeway, with no intersections at grade and separation structures for all cross traffic. State Highway Engineer G. T. McCoy explained that original plans called for an expressway with some intersections at grade, but that great increases in population and traffic have made development to the highest freeway standards necessary as soon as possible.

DETERMINING BITUMEN AND MOISTURE CONTENT OF BITUMINOUS MIXES BY A NEW FIELD TYPE EXTRACTOR

By ERNEST ZUBE, Supervising Materials and Research Engineer

INTRODUCTION

A PROBLEM of prime importance confronting the paving engineer is the accurate and positive control of the asphalt content in bituminous mixtures. The problem of control has become increasingly more complex in recent years with the advent of the continuous type mixing plants which proportion the ingredients of the mixture by synchronized volumetric measuring devices.

Since the successful paving mixture depends to a large degree on a uniformly controlled gradation of aggregates and a consistently proper amount of asphalt it becomes obvious that the engineer should be equipped with a simplified, rapid and dependable method for determining at the job site the day to day uniformity of these essential factors. Consequently, many engineers have felt that there has been a need for a bituminous extractor which will accomplish this objective.

Various Methods Studied

Various methods and equipment for the determination of the bitumen content have been studied and tested by the Materials and Research Department over a period of several years before developing the method described. These methods all had one or more of the following faults: Complicated manipulations, inflammable or toxic solvent, lengthy calculations, difficulty in extracting certain types of mixes (particularly fine mixes), excessive time required to complete extraction tests, and the reliability of results in many cases not too certain.

In developing a new type of bitumen extractor it was a requisite that the equipment meet the following requirements:

1. The apparatus must be portable and easy to assemble.
2. It must be comparatively simple to operate.
3. The results obtained must be dependable.
4. Test results, including bitumen content, moisture content and gradation of aggregate must be obtainable in less than four hours.

An extractor meeting the above requirements has now been developed by the Materials and Research Department of the California Division of Highways. This extractor although referred to as a field extractor, was originally designed for use in our district laboratories, however, it may be easily transported and quickly set up for use at the job site. The apparatus extracts both bitumen and moisture from the mixture in one operation. A specially designed companion drying unit permits rapid drying of the extracted sample.

Two Stages

Briefly, the extraction process consists of two stages. In the first, any free moisture present in the mix is removed by distillation and condensed in a moisture trap in a manner similar to that employed in the xylene reflux distillation apparatus except that Stoddard solvent is used instead of xylene. The second stage consists of removing the asphalt-laden solvent through filter paper by the use of compressed air. This is followed by flushing the sample with clean solvent. After removal of the solvent the sample is ready for drying and grading. The entire operation requires not more than three hours. It is possible to turn out five to six extractions per day if an additional source of heat is available so that an extraction may be carried on while the previously extracted sample is drying.

The extractor and drier are designed so that heat may be supplied either by a gasoline blowtorch or if available, gas may be used with a special burner. Compressed air for forcing the solvent out of the mix is supplied by an automobile tire foot pump or from a compressor if such is available. The blowtorch and tire foot pump were included primarily to make the unit adaptable for field use.

EQUIPMENT REQUIRED

- Extractor.
- Sample drier.
- Blowtorch or a Johnson Auto-blast Bunsen Burner.
- Automobile tire pump (foot type preferred).
- Filter paper.
- Balance 2½ kg. min. capacity 0.10 g. sensitivity.
- Stoddard solvent.
- Gasoline (white, used with blow torch).

The extractor assembly (*Fig. 1*) consists of a top and bottom plate between which the metal thimble (*Fig. 4*) is clamped. The top plate is

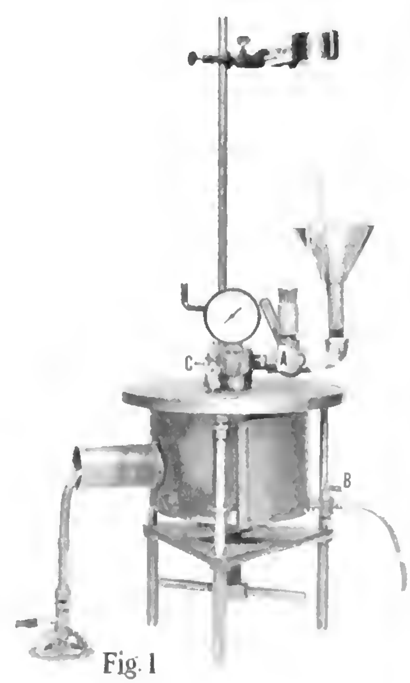


Fig. 1

equipped with a solvent intake funnel, stirring crank, safety valve, pressure gauge, and a three-way valve for the control of the flow of solvent or air. The bottom plate is fitted with a valve and short length of copper tubing for exhausting the solvent.

The drier (*Figs. 2* and *3*) is a heavy sheet metal cylinder, closed at the bottom an open at the top and is mounted on three legs. An opening near the bottom permits the application of heat from either a Bunsen Burner or blowtorch.

Fig. 2

The filter paper (*Fig. 4*) is of a heavy type that will withstand considerable abrasion and is about the thickness of a blotter.

The solvent is known as Stoddard solvent and can be readily obtained from most service stations by calling for cleaning solvent. The retail price is about $0.30 per gallon. It is manufactured to specifications which require a minimum flash of 100 degrees F. and a maximum end point of 400 degrees F. This solvent is inflammable but not dangerously so. It closely resembles kerosene in this respect and should be handled in a similar manner.

The extractor should be set up in a well-ventilated place. If piped water is not available, two five-gallon containers are normally sufficient to provide ample cooling water for the condenser.

Fig. 3

PROCEDURE

The sample, consisting of approximately 750 gm. of the mix is placed in the inner basket of the thimble assembly and weighed. (See *Fig. 4.*) The thimble assembly is then clamped in position in the extractor and approximately 300 ml. of solvent poured through the funnel into the sample.

The cooling water is then turned through the condenser and heat is applied to the extractor at a rate sufficient to cause refluxing to start in 20 to 40 minutes.

Water contained in the mix is collected in the bottom of the trap since it is heavier than the solvent. Heating is continued until the moisture in the trap has reached a constant volume.

When this point is reached the heat is removed from the extractor and an additional 200 ml. of Stoddard solvent is poured through the top of the condenser into the sample. This will wash down any moisture collected on the sides of the condenser, help to cool down the sample and dilute the asphalt-ladened solvent already in the extractor.

Solvent Pumped Out

The valves on the extractor are now set to pump out the solvent by means of compressed air supplied by either the foot pump or a compressor. This forces the solvent carrying the asphalt through the filter paper leaving the aggregate clean. Average plant-mixed samples seldom require over 30 pounds air pressure.

Occasionally samples of bituminous mixes during the extraction process tend to plug the filter paper due either to a high percentage of fines or to the nature of the bitumen. It is necessary in these cases to use the stirring device. The stirring device serves as a scraper and provides a fresh filtering surface on the filter paper.

After the first charge of solvent has been pumped out additional charges of 500 ml. of solvent are placed in the extractor and pumped out. Usually a total of three or four charges are sufficient to flush all the extracted asphalt from the sample.

The next step consists of removing from the extractor the thimble and inner basket which are then placed in the drier. Heat from either a blowtorch or Bunsen Burner can be applied to the drier. Approximately 45 minutes is required to dry the sample. The sample is then cooled and weighed. If an oven is available the sample may be dried out in the oven with the temperature maintained at about 225 degrees F. However, oven drying is slow and the sample must be left in the oven about 15 hours. Drying the sample to remove the solvent can best be performed outside or under a hood to avoid breathing the hot solvent vapor which is somewhat irritating.

SAMPLE CALCULATIONS

To determine the percentage of bitumen, the loss in extraction less the ml. of water caught in the trap, is divided by the weight of the aggregate after extraction.

To determine the percentage of water, the ml. of water in the trap is divided by the weight of the mix (dry

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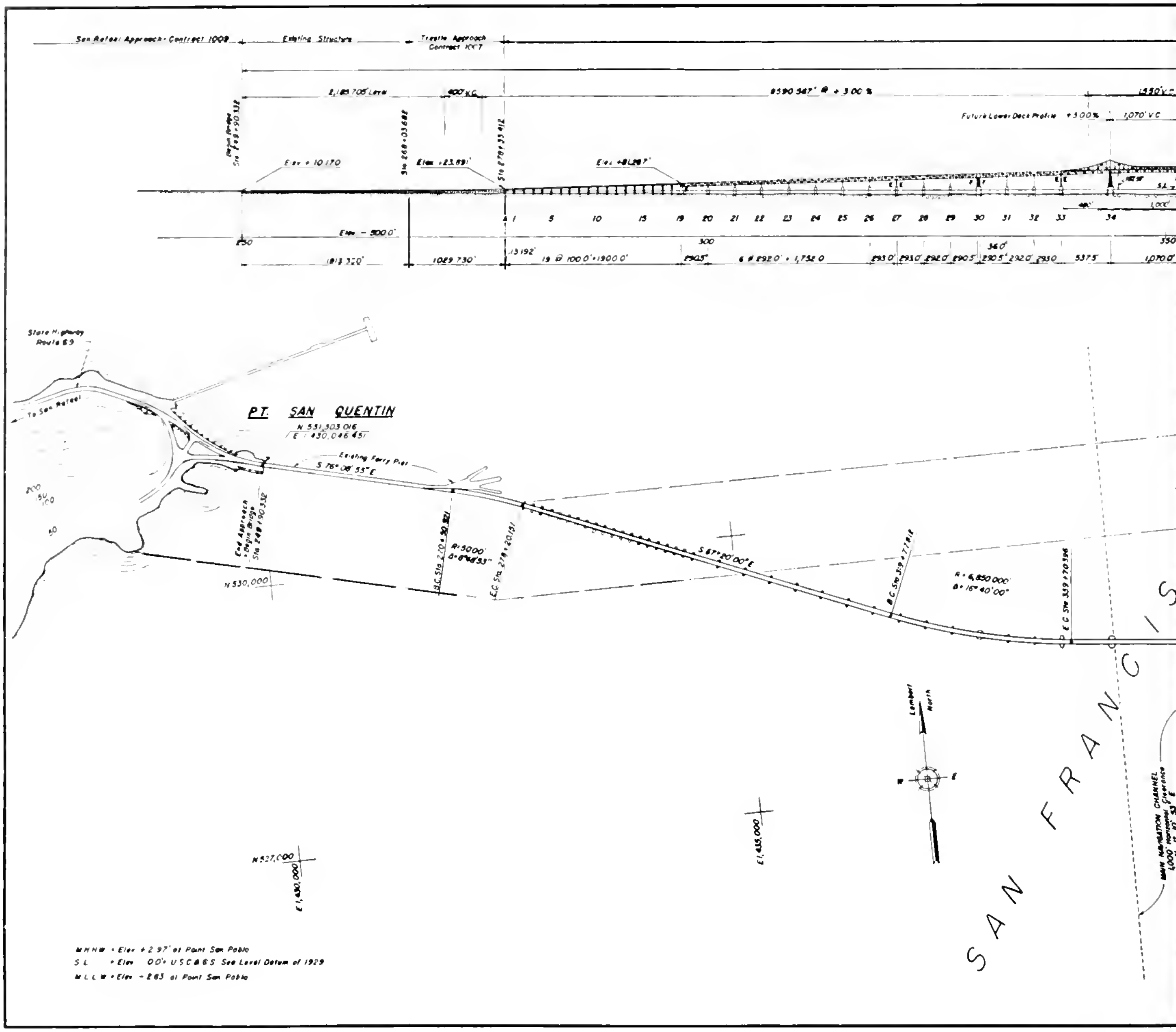


Richmond-San Rafael Bridge Pier Construction

Continued from page 25 . . .

and gradually raised, but with the lower ends always buried in fresh, or unset, concrete. This procedure allows the deposition of additional concrete into the mass without its coming into contact with the water.

5. The tapered shells, with diaphragms, are placed on the lower shell section and centered by matching rings in both sections. These are followed by the upper and smaller cylindrical sections, forming the pier shafts and their diaphragms. The pier shaft sections extend above the surface of the water.

6. The surfaces of the previously placed five-foot lift of tremie concrete, the shells, and the steel H-piles are cleaned of all deleterious material and marine growths. Large tremie pipes are then lowered through the shafts and diaphragms for placement of tremie concrete to elevation plus five feet in the manner described above.

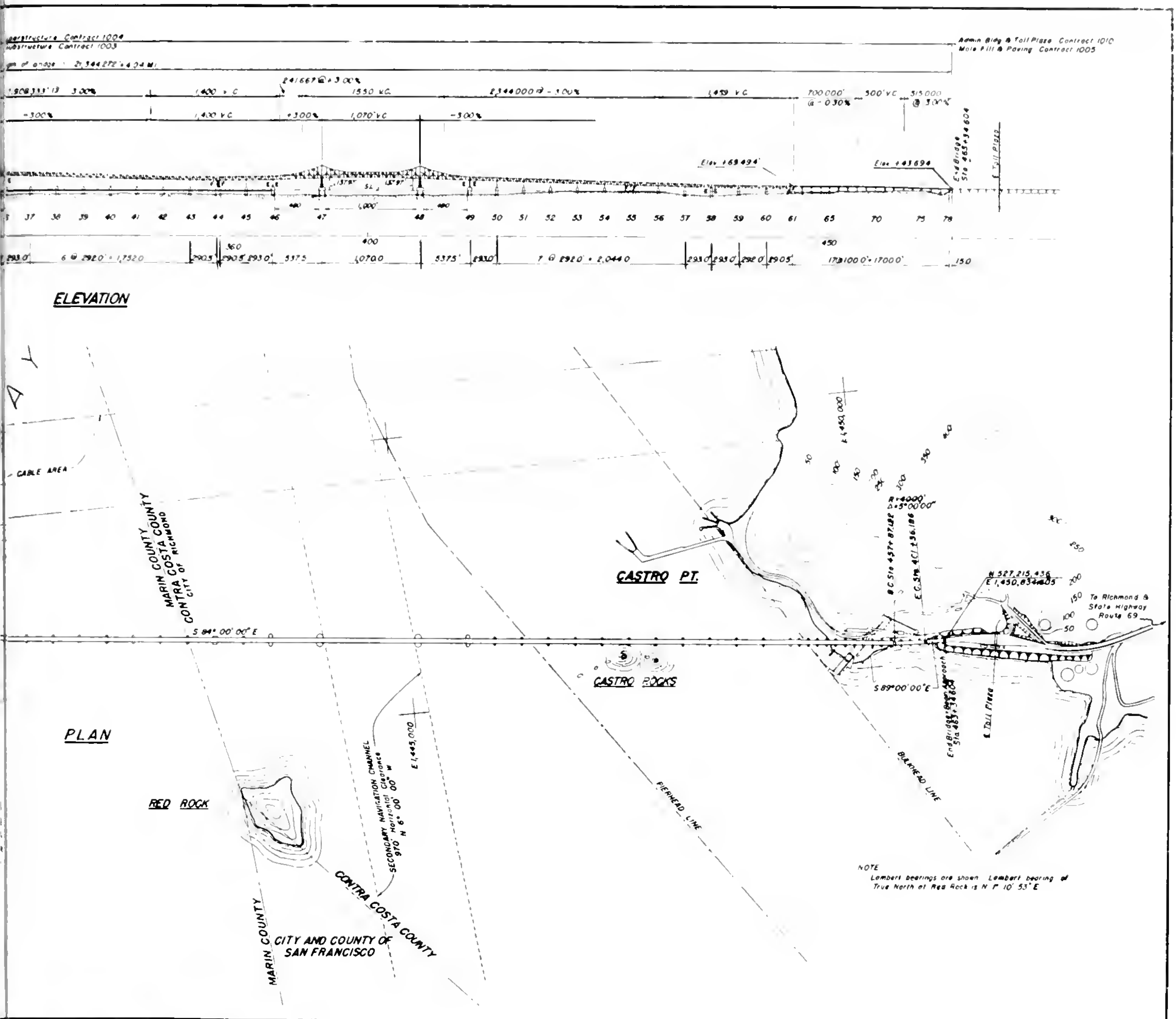
7. Concrete placement above elevation plus five feet and the setting of anchor bolts for the steel superstructure follow the more usual methods of pier construction by forming and placing concrete in the dry.

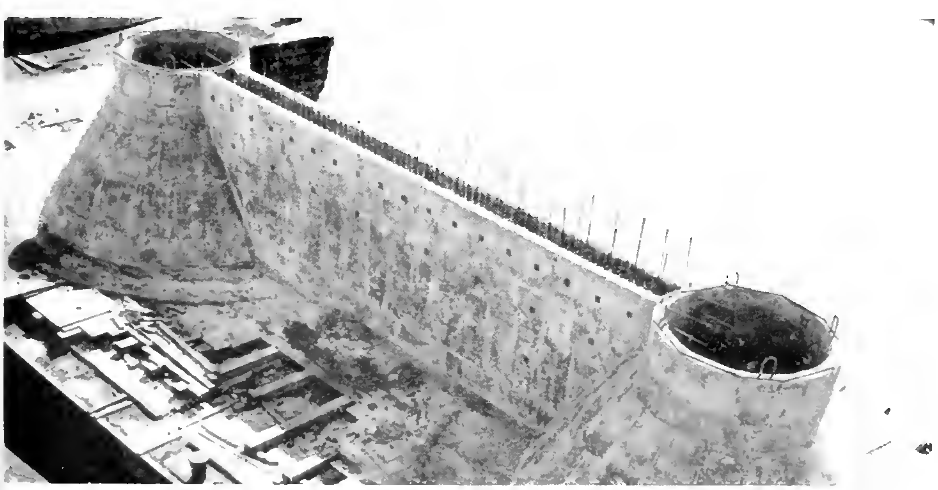
8. Tops of piers are accurately leveled to receive the steel tower bents supporting the truss spans.

Mats Used as Template

These concrete grids or mats are used first as a template for the driving of the permanent steel H-piles, as a platform to rest the bottom 9-foot concrete shell and as a bottom form for the first 5-foot lift of tremie concrete.

The mats are kept in their proper relative position by the placing of a removable strut between the two grids and in their final position by





Precast cone and diaphragm for section of Pier 8

first driving the center vertical pile in each grid to prevent any displacement while driving the battered piles. The center pile is generally from 5 to 10 feet longer than the length estimated by borings for the piles at the particular pier. After driving the vertical pile, the exact length of the other piles to be driven is thus established. As a result, very few piles have to be cut off by underwater burning.

. . . Continued on page 64

OCEANSIDE FREEWAY CUTS ACCIDENTS IN HALF

The following news article appeared in the Oceanside *Daily Blade-Tribune* on February 26th:

TRAFFIC INJURY RATE SLASHED IN HALF SINCE O-C FREEWAY OPENING NOVEMBER 16

That the Oceanside-Carlsbad Freeway has been a major contribution to traffic safety was dramatically illustrated today by statistics released to the Oceanside Chamber of Commerce by the local hospital.

For the 90-day period prior to the freeway opening Nov. 16, there were 23 ambulance traffic cases handled by the hospital. Most of these cases from Aug. 16 to Nov. 16, the hospital informed Chamber Manager Zac Dunlap, involved major injuries and confinement periods extending into weeks and months.

From the freeway opening to Feb. 16, however, there were only 12 traffic ambulance cases—barely over half of the pre-freeway rate. Of the 12, all injuries were minor in nature and required only short periods of confinement.

WIDE AREA

The Oceanside Hospital usually receives traffic victim cases from San Clemente to Leucadia.

In commenting on the figures released by Wilma Taylor of the hospital, Dunlap declared:

'The freeway's saving in human life and suffering has already become evident in a brief, 90-day period.

'This should be especially noted by local residents because the life which was saved or the injury which didn't happen could well have been theirs or their loved ones.'

In its edition of March 1st the *Blade-Tribune* further reported:

Freeways are safe ways to travel, indeed. Oceanside's city accident ratio which had been steadily climbing in recent years has taken a sharp dip since the opening of the O-C Freeway, according to figures released today by Sgt. Cliff Haver of the local police department.

BIG ACCIDENT REDUCTION

The city decline substantiated the Oceanside Hospital report (in Friday's *Blade-Tribune*) which showed a slightly less than 50 percent drop in ambulance cases during the three months since the Nov. 16 freeway opening in comparison with the 90-day period prior to the freeway opening. The hospital also reported a dramatic decline in the seriousness of the injuries and the length of hospitalization required.

Haver revealed that since the November freeway opening of 1953, only 85 traffic accidents

. . . Continued on page 64

Looking north along a portion of the Oceanside Freeway, showing some of the grade separations and interchange ramps which have contributed to a sharp reduction in accidents since opening of the freeway on November 16, 1953

Salinas Freeway

First Unit, Market Street to North Main Street, Opened

By E. J. L. PETERSON, District Engineer

The exceptionally splendid cooperation of the citizens in the Salinas area and the untiring efforts of the Salinas Highway Committee are bearing fruit as evidenced by the progress being made in the development of the Salinas Freeway on US 101.

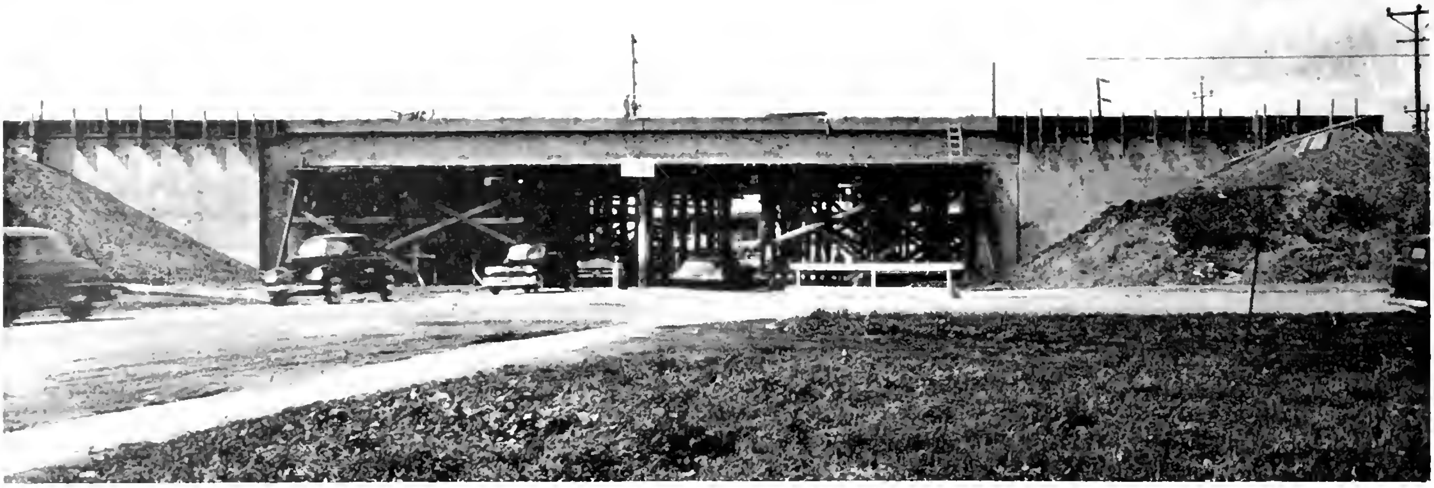
The first unit of this freeway, a length of one mile, between Market Street and North Main Street, was completed in January and opened to local traffic.

The Salinas Freeway is 10 miles in length. Beginning at Hartnell Road near the Spence Underpass, about five miles south of Salinas, it joins the recently completed expressway and extends northerly on the east side of the Southern Pacific Railroad and parallel thereto, skirting the industrial development to the east and passing through a relatively undeveloped area near the easterly city limits of Salinas, then crosses the present state highway, US 101, at North Main Street just south of the Santa Lucia Inn, and extends northerly west of the existing state highway and the commercial development north of the rodeo grounds and the community of Santa Rita to a connection with the existing limited access highway at Espinosa Road. In addition to providing for through traffic it also gives excellent service to local traffic of the combined area of the City of Salinas and the unincorporated community of Alisal.

The planned improvement provides for a four-lane divided highway with the lanes so positioned that it can be developed into a six-lane facility when warranted by increased traffic. Separation structures are provided at all of the important cross roads and streets, namely, Spence Underpass, Bardin Road, Sanborn Road, John Street, Alisal Road, Market Street, North Main Street, Laurel Drive and Espinosa Road. A few cross-overs at grade are to be constructed to provide for access to adjacent farms. The design provides for portland cement concrete traffic lanes with plant-mixed surfacing, ramps and shoulders.

Because of limited funds it was necessary to plan the construction so that usable portions of freeway would be available to the traveling public at the earliest possible date. In order to accomplish this program the section from the existing state highway at North Main Street to Hartnell Road, a distance of 6.2 miles, was scheduled for construction in succeeding fiscal years, with the portion of the freeway from North Main Street to Espinosa Road being deferred until funds may become available. The southerly terminus of the project at Hartnell Road, just south of the Spence Underpass, joins the existing four-lane divided expressway which was completed in 1952. The separation structure at the Spence Underpass will be utilized as

Existing Spence Underpass looking westerly



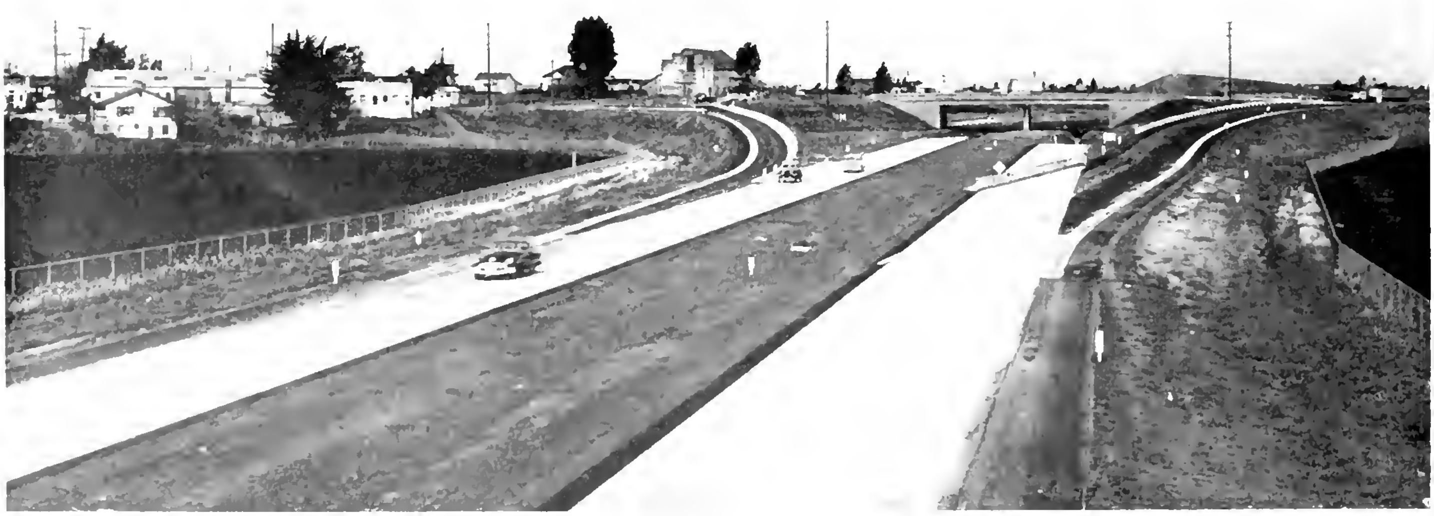
Looking westerly, showing the Alisal Street Undercrossing during construction

a connection to the existing state highway. At the northerly terminus a temporary traffic interchange was constructed at North Main Street to provide for the orderly movement of traffic between the freeway and the existing US 101 to the north end for the northerly extension of the freeway with a minimum loss of investment.

The new location for the freeway traverses the Carr Lake area east of North Main Street. While this area is normally dry, being drained by a canal, it is subject to ponding during periods of heavy rainfall. To guard against inundation the highway grade was maintained above the probable high water requiring a minimum embankment height of about four feet and adequate drainage structures were provided to meet ultimate requirements.

The alignment generally follows level terrain and, because of drainage difficulty, it was impractical to construct the highway below the prevailing elevation of the surrounding ground. The total excavation between Hartnell Road and North Main Street, including local and imported borrow, will be about 1,300,000 cubic yards, involving 36,500,000 station yards of overhaul.

View of North Main Street interchange looking north from Sherwood Drive Undercrossing



View of freeway looking southerly from Sherwood Drive Overcrossing showing Alisal community in background

The project was divided into four units to facilitate construction. The contract for the first unit between Market Street and North Main was awarded to Keeble and Caputo of San Jose, and consisted of the grading and portland cement concrete pavement and two reinforced concrete overcrossings at North Main Street and Sherwood Drive, two double 12-foot box culverts and an 8- x 10- x 268-foot box culvert, together with numerous drainage structures. Ramps and approaches were constructed in connection with the overcrossings and paved with plant-mixed surfacing on cement treated base, also short sections of city streets were connected

East Market Street separation structure under construction, looking westerly, now completed.

with the various crossings. This contract was completed in January, 1954, and is being used by local traffic.

The second unit between Market Street and John Street was awarded to Keeble and Caputo of San Jose. Work started in September, 1953, and provided for grading and the construction of two reinforced concrete overcrossings at Alisal Street and Market Street. The contract will be completed in April, 1954.

To accommodate the flow of the reclamation district drainage canal a double 12- x 13-foot reinforced concrete box was constructed under the freeway at Sherwood Drive. This culvert is skewed approximately 60 degrees and crosses directly beneath the Sherwood Drive overcrossing. Because a center bent would bear directly on top of the culvert it was omitted from the overcrossing structure as will be noted in the picture. This required a span of 108 feet between the two bents which are located outside of the shoulder lines.

During the investigation of foundation conditions for the grade separation structures, borings indicated compressible soils in the vicinity of Market Street and John Street which would not support the structures and embankments without excessive subsidence.

To accelerate the consolidation of the foundation soils at Market Street before building the structure and pavement, approximately 960 vertical sand drains were constructed, a 2-foot sand fill was placed over the area, and a 3-foot surcharge was placed on the embankment. The contractor elected to construct the vertical sand drains by driving a plugged mandrel. After withdrawing the core, the mandrel was filled with sand and pulled leaving the sand in place. During the pulling operation air pressure was applied to help prevent the sand from bridging and being withdrawn with the mandrel. Sand drains were constructed 18 inches in diameter and between 25 feet and 65 feet in depth. After some experimenting the vertical sand drains were constructed by backfilling the hole with sand after pulling the mandrel.

As an aid in determining the state of consolidation of the foundation soils and to provide information for use in future foundation studies, devices for measuring the pore water pressure in these soils were installed at the time the vertical sand drains were constructed. Platforms were placed on the original ground in advance of constructing the embankment and subsidence was measured by means of a steel rod extending through to the embankment of the platform.

Since the foundation was more stable at John Street and consolidation could be accomplished by placing surcharge only, the sand drains were omitted and an 8-foot surcharge was placed on the west approach and a 5-foot surcharge was placed on the east approach to equalize subsidence.

In order that ample time would be available for stabilization of the foundation soils, progress on the construction was planned to allow the surcharge to remain in place approximately one year at Market Street and six months at John Street before

. . . Continued on page 63

Looking westerly along reclamation district drainoge canal showing double 12- x 13-foot reinforced concrete box passing under the Sherwood Drive Overcrossing

New Extractor Determines Moisture

Continued from page 31 . . .

aggregate + bitumen) less the weight of water.

EXAMPLE

	Before extraction	After extraction
Total weight	2,793.1 grams	2,757.4 grams
Thimble	2,093.0	2,093.0
Sample	700.1 grams	664.4 grams

Loss of wt. = 700.1 — 664.4 = 35.7 grams

Moisture caught in trap 7.5 ml.

Bitumen extracted = 35.7 — 7.5 = 28.2 grams

$\frac{28.2}{664.4} \times 100 = 4.2\%$ bitumen

$\frac{7.5}{700.1 - 7.5} \times 100 = 1.1\%$ moisture

A few extractors have been in operation in our District Laboratories for a period of about two years and additional units are being fabricated now. They have shown promise of providing an efficient and accurate extraction method for all types of bituminous mixes. On a few construction projects where continuous type bituminous paving plants were used in producing the bituminous surfacing material the portable extractor has proved useful in providing an accurate check within a two-hour period on the bitumen content. This check is especially valuable at the start of mixing operations when some adjustment of the ingredients is necessary to produce a uniform and stable mix.

As mentioned in the beginning, the development of this type of extractor has been under way for some time. The work has been carried out under the supervision of F. N. Hveem, materials and research engineer. The writer is indebted to several members of the laboratory staff for valuable suggestions and particularly to John Skog and Rufus Hammond, who carried on most of the development work.

High Australian Official on Visit to State

Director of Public Works Frank B. Durkee (left) receives Dr. L. F. Loder in his Sacramento office

On a special visit to California to study highway and freeway construction, the State's public building program and water conservation plans, Dr. L. F. Loder, Director General of the Department of Works of the Australian Commonwealth, visited in Sacramento with Director of Public Works Frank B. Durkee. He will take back with him information on organizational, administrative and technical procedures followed by California in its huge highway and public building construction programs.

Dr. Loder consulted with State Highway Engineer George T. McCoy and officials of the Divisions of Architecture and Water Resources. He will make an extensive field inspection of projects throughout the State before returning to Australia.

Moving Along

San Mateo County Builds Fifth Of Its FAS Road Projects

By S. H. CANTWELL, Resident Engineer

The completion, on January 4, 1954, of two units of Federal Aid Secondary Route 1048 totaling 2.4 miles in southeastern San Mateo County marks another step forward in this county's program of road construction within the Federal Aid Secondary System.

The two units constructed complete a 10-mile loop of safe, moderate speed highway extending southerly from the intersection of the Menlo Park city limits and Santa Cruz Avenue along FAS Route 1048 (the Alpine-Portola Road), swinging westerly and northerly on this road to Searsville Lake, on to Sand Hill Road, FAS Route 1004, and finally on the Whiskey Hill Road, also FAS Route 1048, to the town of Woodside and State Highway Route 107. This highway provides residents of the rapidly growing Woodside-Portola residential area with a route to the more established commute and commercial centers of San Mateo County.

Strike and Weather Delays

The contract on the project just completed was awarded by the Director of Public Works on April 30, 1953, to the L. C. Smith Company of San Mateo. Work was started on May 12, 1953. A loss of valuable "working weather" was registered during June and July due to a labor wage dispute thus causing the work to run into unfavorable weather conditions and delaying the completion date. Work was completed on January 4, 1954, at a final cost of $189,600, exclusive of engineering.

Before the realignment the improvements on Unit No. 1, known as the Whiskey Hill Road, and Unit No. 2, which is a portion of the Portola Road, consisted of two 8- to 9-foot traffic lanes with substandard alignment, blind curves, and dangerous sight distance clearances on the vertical curves. The realignment of these units conformed with the Standards of Federal Aid Secondary Roads in rolling topography with an average daily traffic count of from 400 to 1,000 vehicles.

FAS Route 1048, a San Mateo County road recently reconstructed with federal, state, and county funds

Portola Road at Dennis Martin Creek in San Mateo County—a typical Federal Aid Secondary project

Construction Design

The roadbed section used on this job consisted of two 11-foot traffic lanes with 6-foot shoulders, identical with the finished section used on the FAS project completed in 1952, which project is southerly of and joins Unit No. 2 of the present project. In the project just completed, the traffic lanes were paved with plant-mixed surfacing 2½ inches in thickness and the shoulders were paved with plant-mixed surfacing tapering from 2½ inches at the edge of the traffic lane to 1¼ inches at the outer edge of the shoulder. Underlying the plant-mixed surfacing is six inches of untreated rock base and 8½ inches of imported subbase material. This differs from the last FAS project where a Class "B" single seal coat was applied to the six-foot shoulders.

The major clearing and grubbing on the project was accomplished by letting a separate contract for this work during the winter while the plans for the road project were receiving approval and being advertised. This was done with the thought of completing the clearing during the rainy season so that the contractor doing the road work would be able to make the most of the dry "working weather."

Excavation Job

The major portion of the earthwork on the project consisted of excavating material from a 35,000 cubic yard rock cut on Unit No. 1 and hauling this material over Unit No. 1 for a distance of approximately one mile, and an additional mile over the Sand Hill Road which separates the two units comprising the project to Unit No. 2 where the material was deposited to make the roadway embankment through Upper Searsville Lake.

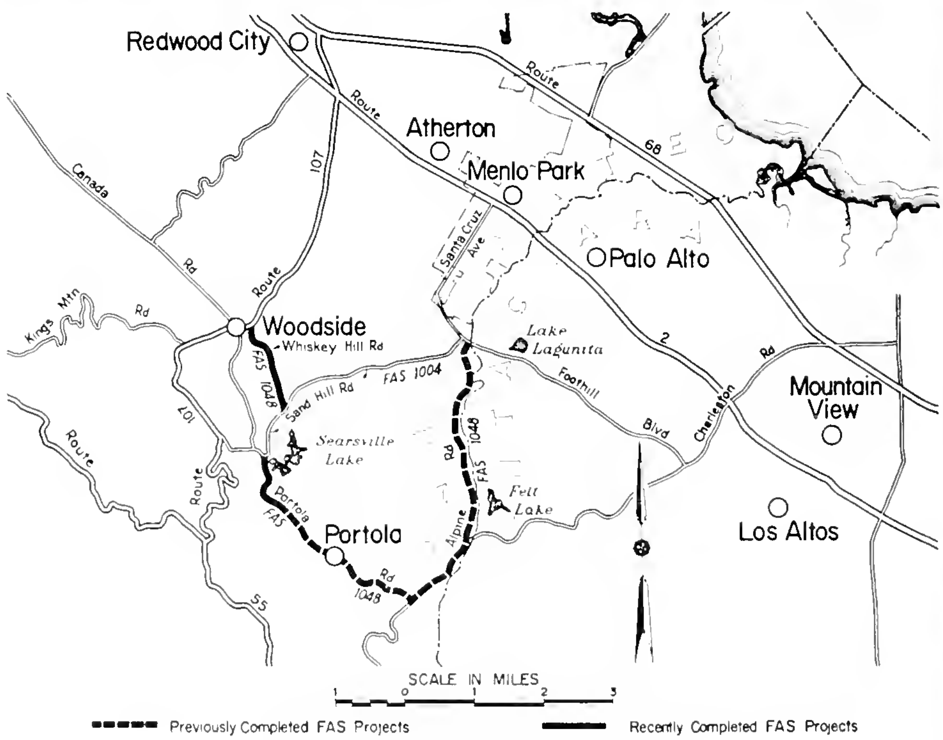
Additional right of way required for the realignment and construction of the project was acquired by the County of San Mateo. The only court action necessary for the acquisition of the right of way was a friendly condemnation suit against Leland Stanford Jr. University which was necessitated by certain deed conditions under which the university acquired title to the land. Very little difficulty was encountered in the acquisition of this right of way by the county which was an indication of the general public's approval and desire for this improvement.

North end of Portola Road. This county road was recently reconstructed under the Federal Aid Secondary Highway Program.

Built on State Standards

The county has adopted as its own standard, the Division of Highways' Standard Specifications and Construction Manual which publications are used by the county's construction forces on all county road work. The policy of using as many of the State Division of Highways' construction procedures, specifications and forms has enabled the county to draw on the State's experience and facilities which has kept the county abreast of many of the new developments in road building pioneered by the Division of Highways. This allows the county to integrate these developments into its own program with a minimum of time or effort expended, thus enabling the county's limited forces to concentrate on the planning and construction aspect of their road building program.

Although the federal aid secondary program is carried out in cooperation with the Division of Highways and the United States Bureau of Public Roads, San Mateo County uses its own forces for preliminary and construction engineering. The County Road Commissioner, M. A. Grant, and his staff are looking forward to more FAS projects which are now in the planning and designing stage.



Whiskey Hill Road & Alpine-Portola Road
San Mateo County FAS Route 1048

Superintendents for the contractor, L. C. Smith Company of San Mateo, during the construction on the project were J. H. Thomas and F. H. Brown.

Conveyor Tunnel

Freight Travels Under New Freeway Section on US 101

By J. F. POWELL, Assistant Right of Way Agent

SINCE opening of a new freeway section on US 101 between Chualar and Spence underpass, south of Salinas, the neighboring Eckhart Seed Co. has two trucks for sale.

It also has two former truck drivers employed elsewhere in the plant, for all rail freight is now carried between the plant and spur track by a conveyor passing through a tunnel under the new freeway.

History of the tunnel goes back indirectly to 1936 when the Eckhart company began rail loading and unloading operations at the old Spence siding. This involved crossing the conventional highway in front of its plant, driving several hundred yards south on the highway, making a right angle turn directly onto and over the Southern Pacific mainline tracks, then turning south to the freight dock. Return was, of course, by the same hazardous route.

In 1942 a railroad accident at this crossing demolished an Eckhart truck and killed two employees.

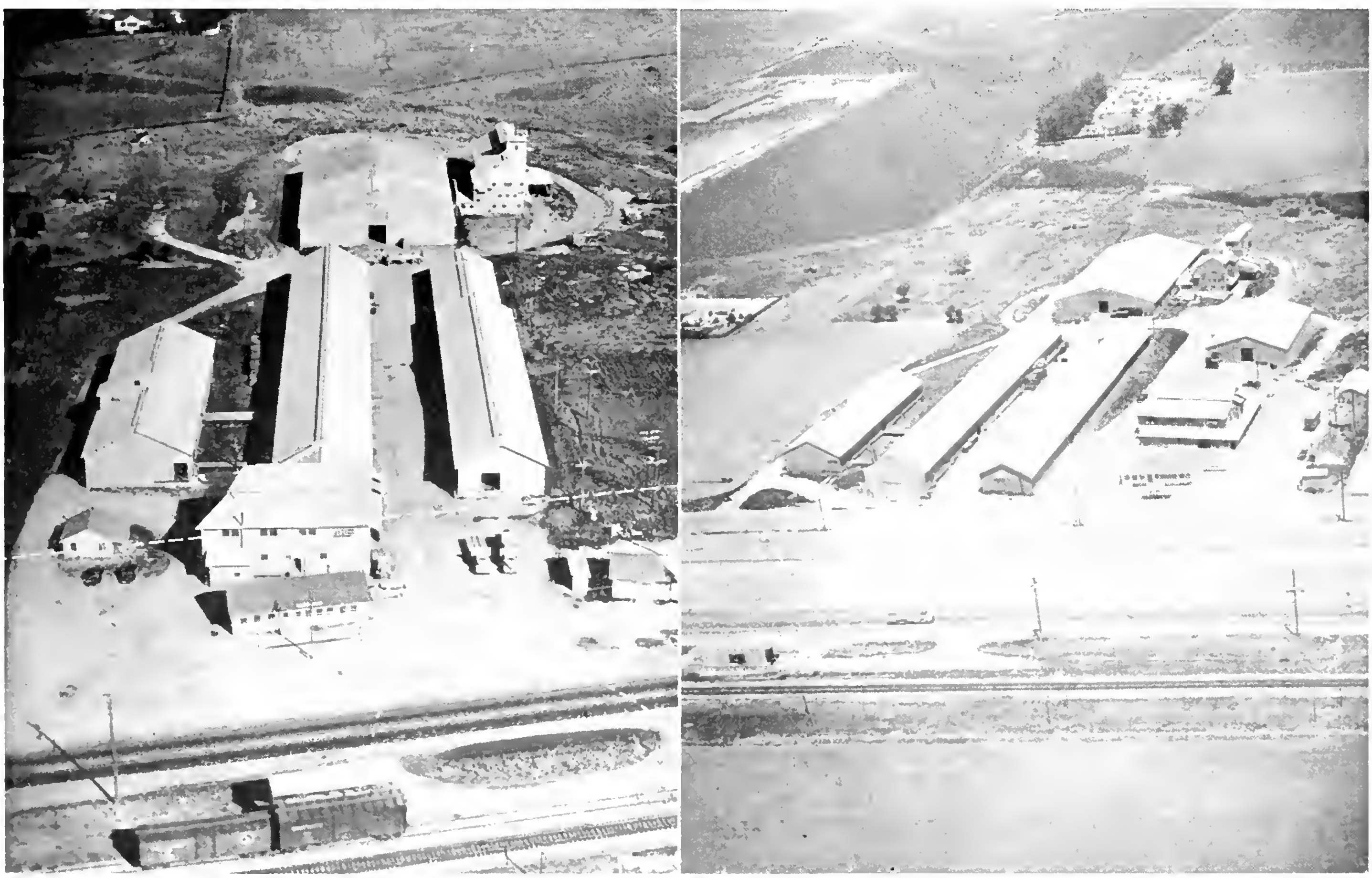
Siding Problem

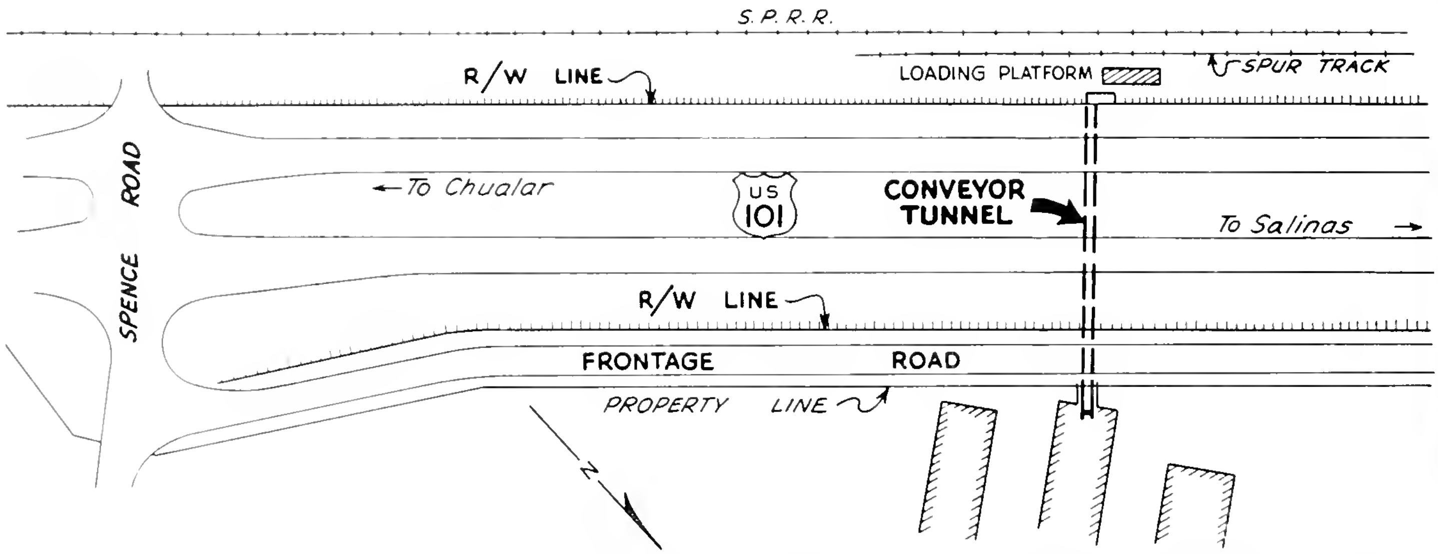
This moved the Eckharts to apply for a spur track crossing the highway and coming alongside their own plant. In view of the ever-increasing traffic and attendant dangers along the crowded conventional highway, it is understandable that the application was not granted.

The company did, however, obtain a siding and construct a loading dock on Southern Pacific property between the mainline tracks and the highway, directly opposite the plant. This eliminated the danger of many truck trips across the tracks but not across the ever-busier highway. In subsequent years the company considered itself fortunate to get by with a single traffic accident damaging one of its trucks.

In 1950, as plans were being completed and appraisals made to widen

LEFT—Before view. Dotted line shows new right of way boundary. All improvements forward of this had to be relocated. Other lines show former route of trucks to and from loading dock. RIGHT—After view. Dotted lines show where conveyor tunnel lies under freeway. Note relocation of buildings. Mill building has new location. Large new building, upper right, not involved in move.





the existing highway and convert it to limited access freeway status, it became increasingly apparent that taking of access on both sides would seal the Eckhart company off from its loading dock.

After considerable relocation and rearrangement of its other facilities the company was to be served by a frontage road leading south to an expressway connection at Spence Road.

Traffic Hazard

Trucks could, of course, come down this frontage road and cross both freeway lanes to reach Southern Pacific operating property. Space and topography, however, precluded driving up railroad right of way to reach the existing loading dock. Crossing the mainline tracks to reach the old Spence siding to the south again did not, of course, appeal to the seed company. Nor did it appeal to Dis-

LEFT—At west end of tunnel, main belt dumps sacks on short belt for trip up to freight dock. Belt on left is for incoming shipments. RIGHT—With a slight rearrangement, belts at freight dock end can be reversed to feed incoming shipments from car to reversible main belt.

LEFT—As vehicle traffic speeds overhead, an outbound shipment of California navy beans moves from plant to car under the freeway. RIGHT—With conveyor reversed and outgoing feeder chute hoisted clear, main belt delivers incoming sacks quietly and efficiently to main warehouse. Head wall of tunnel is right of way line.

trict V engineers and right of way agents who, in studying the number of truck trips that would have to be made across the freeway in an average year, recognized a traffic hazard problem requiring immediate solution.

The matter of damages to the seed company by virtue of cutting it off from its loading dock did not enter into the matter, incidentally. Whereas unity of use existed between the plant and the dock, there was no contiguity nor unity of ownership. Compensable damage may have accrued to the Southern Pacific railroad, on whose land the dock was located, but not to the seed company in this respect.

Tunnel Is Solution

In the meantime, however, no solution presented itself that did not involve crossing both the freeway and the railroad tracks, until the possibility of a tunnel under the freeway was suggested. Investigation indicated this to be a practical solution to the traffic hazard problem and, incidentally, the company's freight loading and unloading problem.

Construction details were worked out cooperatively by C. H. and H. C. Eckhart of the seed company, by District V representatives, and by engineers of Link-Belt Company.

Construction was in two phases, the east portion of the tunnel being constructed by Fredrickson & Watson Construction Co. when the new northbound freeway lanes were built, and the west portion being completed by Rice Brothers, Inc., when the existing highway was subsequently resurfaced to serve as southbound freeway lanes.

By open cut method, 90-inch multiplate was installed for approximately 200 feet with a concrete flooring. Reinforced concrete wells and stairs were constructed at each end and the State's work was complete.

Conveyor Equipment

The Eckhart brothers then proceeded to give the tunnel interior a coating of white paint, to reconstruct the loading dock, and to purchase and install approximately $10,000 worth of Link-Belt conveyor equipment. Cost of labor was estimated at $5,000, as all installation was done and many additional items of equipment were fabricated on the job by Eckhart employees.

The main 2-foot by 500-foot belt is powered by a 7½ h. p. motor with gearhead drive.

Operation is relatively simple. Lift trucks bring outgoing cargo (usually 100-lb. sacks of processed beans, peas, or seed) to the east end of the conveyor. With one man loading the conveyor and two men at the other end transferring the sacks into a car, one 30-ton freight car can be loaded with 600 sacks in an hour.

Rapid rearrangement of certain chutes and short feeder belts permits reversal of the main belt to handle incoming cargo.

Complex Relocation

Inclement weather can no longer interfere with loading or unloading operations, as freight is under cover from plant to car.

Construction of the tunnel actually was only a small part of a rather complex relocation and rearrangement of facilities necessitated by freeway construction in the seed company area, as can be quickly noted from the accompanying before and after views.

Involved in moving were the company's main office and truck scales, well and pump house, restaurant building, and most important of all, the large mill building containing 2½ stories of complicated processing machinery.

By a schedule carefully coordinated between road construction and plant relocation, advantage was taken of the company's slack season, and all moving completed without loss of a day's production.

MR. KELLY DESERVES THIS

ASSOCIATION OF WASHINGTON CITIES
250 Smith Hall, University of Washington
Seattle 5, Wash.

March 12, 1954

Mr. Kenneth C. Adams, *Editor*

Dear Mr. Adams: Although I have not had the opportunity of reading the entire contents of your last publication of the magazine *California Highways and Public Works*, January-February issue, I have had the opportunity of reviewing its contents and reading in some detail the article by Mr. Kelly on motels and freeways, and wish to convey to you and your staff our appreciation for these publications.

This last issue is outstanding, although the other ones are of tremendous value. Please be assured that we appreciate the fine work you and your colleagues are doing.

Sincerely,

Floyd M. Jennings
Planning Consultant

Annual Bonneroo In Los Angeles Being Planned

The Construction Department of District VII, Los Angeles, State Division of Highways, will have its Third Annual Bonneroo Stag Party at the Rodger Young Auditorium, located at 936 West Washington Boulevard, Los Angeles, on the evening of May 7, 1954, to honor resident engineers and contractors who completed the 10 best contracts in the district during the calendar year of 1953.

Resident engineers on the 10 best contracts were Haig Ayanian, H. E. Belford, R. A. Collins, Basil Frykland, J. L. Needham, and C. J. Woodbridge. Contractors were Griffith Company, J. E. Haddock, Ltd., Sully-Miller Contracting Company, Ukropina, Polich, and Kral, Webb and White, and Winston Brothers Company.

The best contract of the 10 will be announced at the party. The resident engineer and the contractor will each be awarded a trophy signifying the completion of the best contract for the State Division of Highways in District VII during 1953. The assistant resident engineers and the contractor's superintendent on the best contract will be presented with certificates of honorable mention. State Division of Highway personnel, and all contractors and their employees, are cordially invited to attend.

The story of how the "Bonneroo" got started and why this festive occasion got this name was explained in detail in the November-December, 1952, issue of *California Highways and Public Works*.

New construction during the 1952-53 Fiscal Year made possible the dropping from the posted bridge list of the Division of Highways of five bridges with load restrictions and 10 with speed restrictions. On June 30, 1953, there remained 33 bridges on state highways posted for reduced loads and 72 for restricted speeds. As of the end of the 1952-53 Fiscal Year there were 4,875 bridges on the State Highway System.

Bay Bridge

Continued from page 18 . . .

The widening of the toll plaza and its approaches to provide for 10 additional toll gates will not only serve to expedite traffic flow across the bridge but will also tie in with East Bay highway improvements and with the North Harbor development contemplated by the Port of Oakland. The design of the project allows for access to any future harbor improvements north of the bridge approach.

Roadway Widening

The roadway widening will extend from the East Bay Distribution Structure to and beyond the toll plaza. Expansion and widening of the Distribution Structure and the Eastshore Freeway north from Oakland are now under contract.

The Port of Oakland Overhead will be reconstructed and extended to span the widened highway east of the toll plaza.

When the new toll lanes have been completed and the existing lanes revised, all drivers bound for San Francisco will pay their tolls at one of 15 booths north of the administration building and all eastbound drivers will pay at one of 15 booths south of the building. Collection will be from the driver's side only. Experience has shown that "on-side" collection is more efficient and is preferred by bridge patrons.

Another project financed from the bonds issued by the Toll Bridge Authority has already been completed at a cost of $220,000. This was the construction of a new painting gantry, or scaffold, which simplifies the maintenance and painting of the bridge and improves safety conditions for employees.

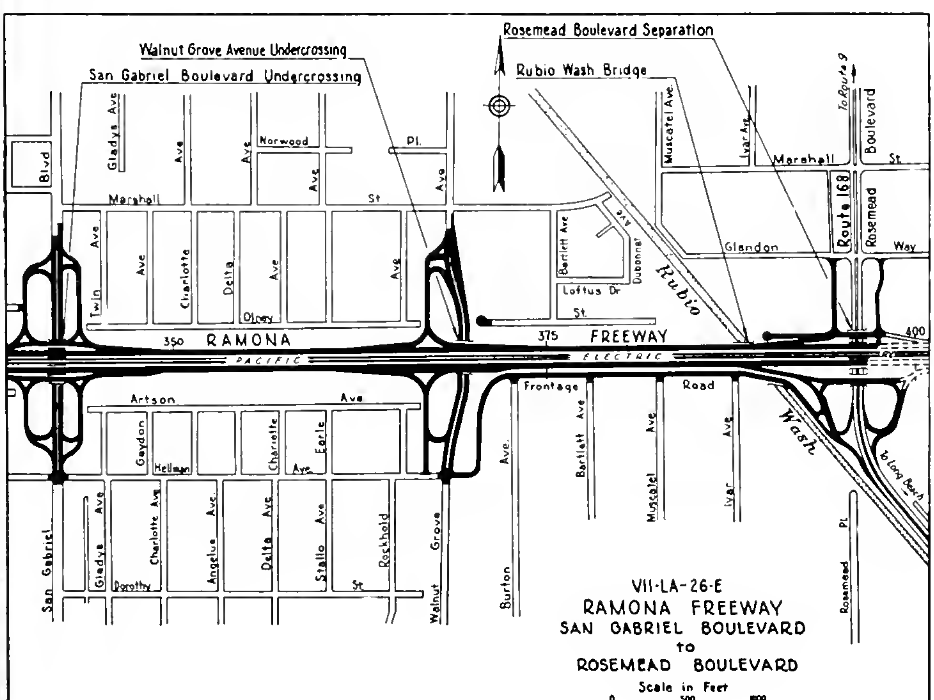
GOOD TEAMWORK ON THE HIGHWAY

Signals clearly given and understood make for good teamwork on the highway, points out the National Automobile Club. Motorists who clearly and deliberately signal their intent to turn or stop, and those who watch carefully for such signals, are helping substantially to reduce our tragic traffic accident toll.

ANOTHER MILE OF RAMONA FREEWAY OPENED TO TRAFFIC

UPPER—Highway Commissioner Robert E. McClure officiates at ribbon cutting on Ramona Freeway. LEFT TO RIGHT: H. N. A. Stump, President of Rosemead Chamber of Commerce; Audrey Runyan, Dorothy Buckley, Jeanine Nelson, Commissioner McClure, Colleen Kolbfleisch, Gay Egetter. LOWER—This map shows the new section of the Ramona Freeway. Traffic interchanges at San Gabriel Avenue, Walnut Grove Avenue and Rosemead Boulevard will give access to the freeway for practically every motorist of the area served.

On Tuesday, February 16th, last, another mile of the Ramona Freeway in Los Angeles County was opened for the use of the motoring public. This section was from San Gabriel Avenue to Rosemead Boulevard. The contract was completed by Griffith Company of Los Angeles at a cost of $2,500,000 and extended from Jackson Avenue to Rosemead.



The contractor finished the unit to San Gabriel Avenue first and that section was opened last December. Completion of the last mile was made the occasion for a celebration by Rosemead citizens.

The Rosemead High School Band, the Majorettes, the Flag Girls and the Color Bearers all turned out for the event, sponsored jointly by the Rosemead Chamber of Commerce and the Kiwanis Club.

Burl Blue, Jr., Chairman of the Roads and Highway Committee of the Chamber of Commerce, and Ray Galceran, Public Affairs Committee of the Kiwanis Club, were comasters of ceremonies. Introduction of special guests and remarks by representatives of chambers of commerce surrounding Rosemead participated.

Robert E. McClure, California Highway Commissioner from Santa Monica, was the principal speaker and cutter of the ceremonial ribbon. He was helped in the ribbon cutting by five young ladies, known as the Rosemead High School Princesses, and by H. N. A. Stump, president of the Rosemead Chamber of Commerce.

TEMPORARY TRAFFIC STRIPE SOLVES HIGHWAY PROBLEM

By W. T. RHODES, Associate Highway Engineer

The expeditious handling of traffic through construction and particularly the proper delineation of the traffic lanes has become an increasing problem in view of the ever increasing traffic flow. This is especially aggravating on projects where it is necessary to shift traffic lanes on paved areas to clear different construction operations.

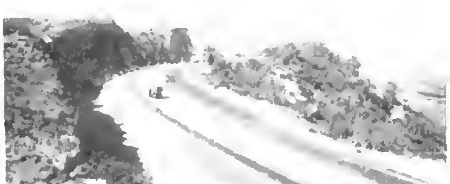
Contract 54-11VC7 provided for the construction of an additional uphill lane for trucks between the Torrey Pines Mesa and Penasquitos Creek, XI-SD-2-SD. During grading operations, in order to accomplish this, the existing center island curbs had to be removed and traffic shifted to the right portion of the roadway while grading was in progress adjacent to the left lanes. Later traffic had to be shifted to the left while paving operations were in progress on the right lanes. The large volume of high speed traffic required four lanes open at all times plus room for the contractor to carry on his construction operations. It was apparent that traffic lanes would have to be changed a number of times and must be done quickly and efficiently without interference to the flow of traffic or undue delays to the contractor.

Prefabricated Strips

The conventional method of painted stripes was not considered to be the best solution because of the impossibility of removing or adequately obliterating the stripes when traffic was to be shifted and the probability of numerous conflicting stripes after one or two shifts of the traffic lane. As a solution to this problem, prefabricated strips were constructed of heavy roofing paper, 4-inch by 36-inch strips being cut from the roofing paper roll, painted with white traffic lacquer and glass beads applied.

To apply these strips to old pavement, an adhesive was used to hold them in position until traffic had permanently sealed them to the pavement. Asphaltic emulsion was used as an adhesive because of its availability although possibly some other colorless adhesive would be better, particularly on white portland cement concrete pavements. As a word of caution, the use of adhesives can be overdone; only enough adhesive is necessary to hold the strips in place to prevent traffic from sucking them off of the pavement. After a short time, these

Placing strips on new plant-mixed surfacing to delineate traffic lane. Closeup showing pavement lane delineation strips adhering to rough-textured pavement. Pavement lane delineation strips placed immediately behind paving operations. General view of traffic lane markings.



Placing strip on new plant-mixed surfacing prior to last pass of roller. Final pass of roller bonding pavement lane delineation strips to new plant-mixed surfacing. General view of traffic lane markings. Night view of pavement lane markings.

strips will adhere without trouble, due to the kneading action of traffic. If too much adhesive is used, they may have to be burned off the pavement and the resulting black spot defeats the purpose of the strip. If they have been placed correctly, no trouble should be experienced in removing them with a blade grader or a square point shovel.

Economical Feature

The ease of application on plant-mixed surfacing by one man provides the most economical feature. The strips, without adhesive, are laid on the warm pavement just prior to final rolling. The heat from the pavement, plus a pass with the roller, bonds them to the pavement, resulting in a well defined traffic lane ready for use as soon as the pavement is opened to traffic. Leveling course ahead can be lined in the same manner.

The slight elevation above the pavement afforded by the strips apparently creates outstanding visibility particularly at night under headlight beams. It is believed that any slight increase in cost over other temporary stripe, is more than offset by additional convenience and safety of the traveling public.

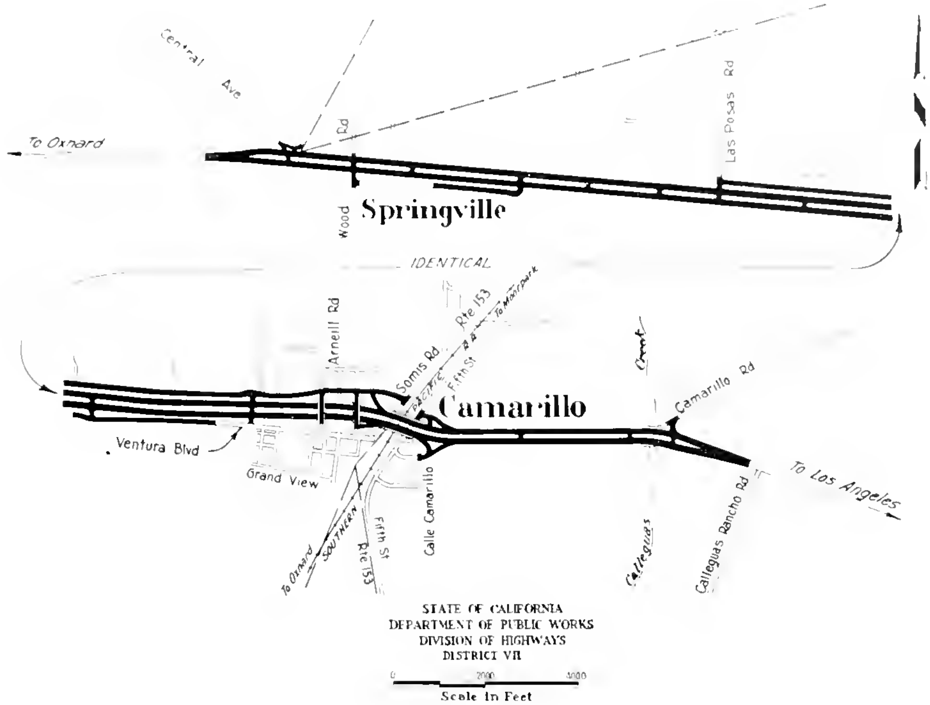
The above described method of applying temporary traffic stripe was developed by the writer, Resident Engineer, District XI.

USE JUDGMENT

Judgment is more important than merely obeying the legal limit when it comes to determining how fast you should drive, says the California State Automobile Association. Figures from about half the states indicate that speed is a factor in about 28 percent of all fatal accidents in traffic mishaps, but that in only 17 percent of such cases were drivers exceeding the prima facie limit. In the other 11 percent drivers were moving too fast for the prevailing conditions, even though they were not breaking the prima facie limit.

Nearly 2,500 vehicle drivers representing every district and department of the Division of Highways have been tested for vision and driving ability. The testing program is conducted by the Safety Section on a continuing basis.

Camarillo Grade Crossing on US 101 Eliminated



Elimination of the last railroad grade crossing on U. S. Highway 101 between San Francisco and Los Angeles was accomplished on March 24th when the expressway through Camarillo, Ventura County, was opened to the motoring public. No longer will motorists have to wait while a train is on the siding at Camarillo. They will use the new overhead crossing of the railroad tracks.

The City of Camarillo celebrated the event with a ribbon cutting ceremony under the auspices of the Camarillo Chamber of Commerce. C. C. Tisdale, president of the chamber, was master of ceremonies and introduced the guests and speakers at the celebration.

Spectators gathered on the eastbound lane of the four-lane highway midway between the overpasses over Arneil and over Fulton Street, just opposite Glen Drive, which has become a closed street since the highway has been built.

The contract for this improvement was for well over a million dollars and gives through traffic an uninterrupted highway through Camarillo and over the railroad tracks. The contract for the overhead and a separation structure over the railroad was for more than half a million dollars alone. This structure consists of two parallel bridges each 578 feet long and each provides a clear roadway width of 40 feet.

The completion of this project will remove the hazards of the grade crossing of the railroad and also facilitate cross traffic along Route 153 from Somis Valley to coastal points. It will provide 5.7 miles of new four-lane divided road for the motorists to use. At the present time there is a contract in force just east of Camarillo which goes through Newberry Park. This also is an enlargement of the present two-lane highway to a four-lane divided highway. This contract is for $605,536.37.

Another job in preparation is west of the present road and will go from 0.4 miles west of Central Avenue to the Santa Clara River. This job is 5.1 miles long. There is $1,943,000 in the budget for this new construction.

FAS Funds

Apportionments for County Roads Total $7,365,776

Apportionment of $7,365,776 in federal and state funds to 57 California counties for improvement of county roads on the Federal Aid Secondary System for the fiscal year beginning July 1, 1954, was announced today by State Director of Public Works Frank B. Durkee.

Federal Government funds being made available to the counties total $5,091,975, with the remaining $2,273,801 coming from state highway matching funds provided by 1953 legislation.

The federal funds are apportioned to the various counties according to the same formula used by the Federal Government in distributing them among the various states: one-third on the basis of area, one-third on rural population and one-third on mileage of certain classes of rural mail routes.

Matching Funds

The money from state sources is for the use of the counties in matching the federal funds on the basis of approximately 58 percent federal to 42 percent local funds. The state law

COUNTY APPORTIONMENTS OF 1954-55 FISCAL YEAR FAS FUNDS UNDER FEDERAL-AID HIGHWAY ACT OF 1952 (SECOND YEAR); ALSO CORRESPONDING APPORTIONMENTS OF STATE HIGHWAY MATCHING FUNDS AUTHORIZED BY CHAPTER 1871 OF THE STATUTES OF 1953

County	Federal aid secondary	State	County	Federal aid secondary	State
Alameda	$62,018	$44,359	Orange	$103,401	$50,000
Alpine	25,460	18,211	Placer	64,691	46,271
Amador	25,722	18,398	Plumas	54,561	39,026
Butte	93,606	50,000	Riverside	196,190	50,000
Calaveras	31,109	22,251	Sacramento	121,462	50,000
Colusa	30,574	21,869	San Benito	36,230	25,914
Contra Costa	105,121	50,000	San Bernardino	361,521	50,000
Del Norte	25,460	18,211	San Diego	192,862	50,000
El Dorado	46,412	33,197	San Francisco	----------	----------
Fresno	273,982	50,000	San Joaquin	121,627	50,000
Glenn	40,192	28,748	San Luis Obispo	84,272	50,000
Humboldt	112,898	50,000	San Mateo	31,708	22,680
Imperial	109,282	50,000	Santa Barbara	76,264	50,000
Inyo	127,722	50,000	Santa Clara	122,569	50,000
Kern	231,622	50,000	Santa Cruz	49,198	35,190
Kings	62,013	44,356	Shasta	86,994	50,000
Lake	36,242	25,923	Sierra	25,460	18,211
Lassen	73,847	50,000	Siskiyou	122,077	50,000
Los Angeles	216,815	50,000	Solano	49,023	35,064
Madera	65,912	47,145	Sonoma	139,005	50,000
Marin	37,040	26,493	Stanislaus	126,896	50,000
Mariposa	31,513	22,540	Sutter	37,881	27,095
Mendocino	92,931	50,000	Tehama	60,814	43,498
Merced	95,648	50,000	Trinity	52,169	37,315
Modoc	62,414	44,643	Tulare	205,548	50,000
Mono	46,662	33,376	Tuolumne	43,506	31,118
Monterey	113,337	50,000	Ventura	92,931	50,000
Napa	50,989	36,471	Yolo	44,969	32,165
Nevada	32,111	22,968	Yuba	29,492	21,095
			Totals	$5,091,975	$2,273,801

enacted in 1953 makes state highway funds available to the counties for this purpose, up to a maximum of $50,000 per county per year.

The City and County of San Francisco, being entirely urban, is not eligible to participate in the federal aid secondary program.

On the basis of the federal apportionment formula, next year 27 counties will each receive more than $70,000 in federal funds. Since it takes more than the maximum state contribution of $50,000 to match federal funds above $70,000, additional matching funds must be provided from county revenues if these 27 counties are to take advantage of their full federal apportionment.

The remaining 30 counties will receive state funds in the full ratio required to match the federal amounts, although some small percentage of county funds may be required for contingencies.

FAS System

The county roads on which federal aid secondary funds may be expended are those roads which have been designated by the county, with the approval of the California Highway Commission and the U. S. Bureau of Public Roads, as constituting the county's FAS system.

For the most part, these roads are next in importance to state highways in terms of traffic volume and economic service to the locality, and are often referred to as "feeder roads" or "farm-to-market roads." Of the approximately 68,000 miles of county roads in California, a total of some 5,600 miles are now on the Federal Aid Secondary System.

The largest FAS allocation for 1954-55 goes to San Bernardino County—$361,521 federal and $50,000 state funds. The smallest allocations are to Alpine, Del Norte and Sierra Counties, each receiving $25,460 federal and $18,211 state funds.

SAVING TIME BY CUTTING CORNERS

Many motorists try to save a little time by cutting corners. They may save time at the moment, but they may also find that they are taking a short cut to a shorter life.

In Memoriam

CLIFTON M. ALLEN

Clifton M. Allen, Highway Foreman at Julian, District XI, passed away at Mercy Hospital in San Diego on January 12, 1954. Cliff, as he was known to his friends and fellow employees, was born in Haverhill, Mass., on December 4, 1900. When he was very young his family moved to Canada where he received most of his schooling. In his second year of high school, the family moved to San Diego where his education was completed.

Prior to his entering state service, Cliff was employed by one of the major oil companies in the sales department. In March, 1934, he went to work at Julian Maintenance Station as a laborer. His conscientious devotion to duty won him consistent promotions until in 1944 he was appointed foreman at Desert Center. In November, 1949, he was transferred to Julian, where he continued his good work until his death.

Cliff was always active in community and civic affairs wherever he lived, serving especially well in groups and organizations where youth was to be sponsored. He will long be remembered in Julian for his work with deserving boys in the Soap Box Derby races.

He is survived by his wife, Pauline, and three sons: Lieut. David Allen, graduate of Annapolis, assigned to the Air Force; Sgt. Donald Allen, 22, also in the Air Force; and Gordon, 12; and one grandchild.

Funeral services were conducted on January 15, 1954, from Palm Mortuary in Escondido, with interment in Eternal Hills Memorial Park, Oceanside, California.

HELP YOUNGSTERS OBSERVE RULES

Sometimes persons who drive children to and from classes double-park at the school, thus requiring the youngsters to step between parked vehicles. Children are constantly taught at school not to step between vehicles parked at a curb, a rule that is vital to their safety, so don't encourage the youngsters to violate it, urges the California State Automobile Association.

Education Is Solution to Road Dilemma

The solution to the Nation's highway dilemma lies in education, A. E. Johnson, president of the American Association of State Highway Officials, declared in Los Angeles at the Thirty-fifth Annual Convention of the Associated General Contractors of America.

"Public opinion is now ready for that challenge," declared Mr. Johnson. The critical highway problem—the same road system of the middle thirties with twice the number of motor vehicles operating on it—could be solved, Mr. Johnson said, by "letting the user know how much it costs not to have adequate highways, how much an adequate highway program will cost and letting the people decide how much highway program they will buy."

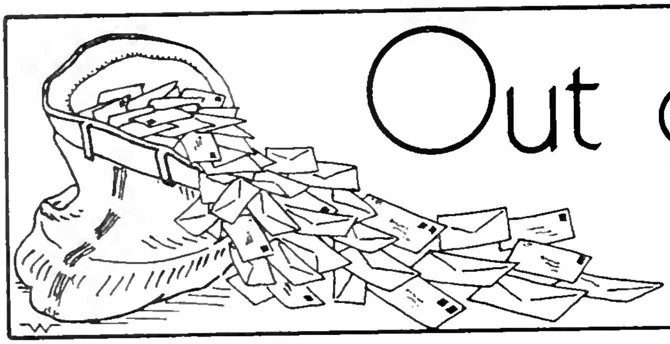
Mr. Johnson, who is chief engineer of the Arkansas State Highway Commission, said there now are 55,000,000 vehicles in this country—enough if bolted bumper to bumper to reach from here to the moon. The United States has 75 percent of all the passenger cars in the world and 50 percent of all the trucks, he added.

While stating that it is "absolutely true that highway revenues have doubled with the traffic increase," Mr. Johnson declared that highway costs have also doubled," so nothing has been gained financially and roads now must be flatter, straighter, wider and thicker to satisfy the traffic demand caused by more and faster cars and larger and heavier trucks."

Mr. Johnson estimated that it would take 50 billion dollars to take care of the over-all needs of the highways, roads and streets in the United States.

NO COLLISION NECESSARY

Motorists need not be involved in a collision in order to have a fatal accident. About 13 percent of all traffic fatalities in cities, and about 40 percent of all rural traffic fatalities do not involve a collision. The largest percentage of such accidents involved running off the road.



Out of the Mail Bag

FROM AUSTRALIA

California Highways and Public Works
Sacramento, California

DEAR SIRS: I have been fortunate in being able to read your journal, *California Highways and Public Works*, while employed by the City of Geelong West during the past three years.

I have now been appointed to the Shire of Bellerine and I would appreciate it if I could obtain future copies of your magazine.

This journal is by far the most useful data in magazine form that I have read and I hope that in the future I may have the pleasure of receiving copies.

Yours faithfully,

Assistant Engineer
G. N. TAYLOR

MAGAZINE HELPFUL

MR. KENNETH C. ADAMS, *Editor*

DEAR SIR: I would very much appreciate being placed on the mailing list for the publication *California Highways and Public Works*.

California Highways and Public Works is certainly one of the finest publications of its nature that I have seen. Every issue that has come to my attention has contained information of value to us in one or more of the phases of the research and planning work which we conduct.

Yours very truly,

W. F. CHASTAIN, SR.
Engineer of Physical Research

A COMPLIMENT

SOUTHWESTERN PORTLAND CEMENT COMPANY
Los Angeles, California

GEORGE T. MCCOY,
State Highway Engineer
Sacramento

DEAR GEORGE: The California Highway magazine is surely a "peach." I gave away my copy, the one that shows the four-level grade separation on the cover. I would appreciate if you will mark this to someone to see if I can get a half-dozen copies and if there is a charge, send a memorandum.

Certainly the department, the authors and editors all deserve congratulations.

Sincerely yours,

GEORGE WARREN
President

ROAD SIGNING PRAISED

SEATTLE 6, WASHINGTON

Editor
California Highways and Public Works

SIRS: Recently I had occasion to drive a car throughout the Bay region, and as a result I was thoroughly impressed with the road posting. This particular day was a foggy one and in addition I know very, very little about what proper turns to make or those not to make.

Across the San Francisco Bay, through Oakland, over the San Mateo Bridge, Palo Alto and on and on, you have expertly posted your roads, so that even a stranger such as I can get around with ease and also not impede traffic.

Thanks.

P. J. KLETT

FROM WALES

MORRISTON, SWANSEA
WALES, GREAT BRITAIN

Editor

DEAR SIR: I write to express my appreciation at receiving your magazine here in Britain since my return from the United States last year.

It is regarded very highly in the highways office of the London firm of consultants with whom I am employed, on account of both the informative contributions it contains from your field and design engineers and the excellent photographic record of the many interesting highway projects in California.

It serves, too, as a welcome reminder of the few weeks that I spent in Sacramento, San Francisco and Los Angeles, in May, June, 1951, and I sincerely hope that you will continue to mail it to me at the above address.

I remain,
Yours sincerely,

HARRY L. HOLLAND

LETTER FROM MELBOURNE

RINGWOOD, VICTORIA, AUSTRALIA
November 30, 1953

MR. K. C. ADAMS, *Editor*

DEAR SIR: Over a number of years I have been receiving your publication, *California Highways and Public Works*. It has helped me in my studies of harbour highway engineering, and also to learn new methods of construction and maintenance.

I wish you and your staff all the best for Xmas and the New Year. I remain

Yours sincerely,

JAMES BROWN

GREETINGS FROM TURKEY

Ankara, December 18, 1953

California Highways and Public Works,
Sacramento, California

DEAR SIRS, In sending you my best wishes for a happy holiday season, I wish also to thank you for the generous help you people of *California Highways* have extended on every occasion during our training trip.

I should like also to thank you for the regular mailing of *California Highways and Public Works*, which is pleasant reading for many people here at home. Although I quit the Turkish highways a year ago, my heart still stays on the highway bridges.

I hope that the New Year will hold for all the kind people of the California Division of Highways all the best of happiness. I hope too, that I shall be seeing again the beautiful redwoods, Pacific Coast and lovely valleys of California.

Yours sincerely,

TURHAN ISKIT
P. K. 1090, Yenisehir
Ankara, Turkey

MAGAZINE INFORMATIVE

LOS GATOS, CALIFORNIA

Editor
California Highways and Public Works

SIR: I have derived great pleasure and information from all past copies of your magazine. Its reading gives one a much deeper appreciation of our Highway Commission's outstanding work and I know that by loaning my copies to my friends it has given them a different view on "Where does our gas tax money go?"

Most sincerely,

A. W. BASSETT

NEW NAME ON LIST

THE EDITOR

DEAR SIR: At various times we have noted references or abstracts in British publications to articles appearing in your publication and we believe it would be a useful addition to our technical library.

I would be glad, therefore, if you would place me on your mailing list.

Thanking you,

Yours very truly,

WM. H. MACMAHON
Chief, Technical Section

LIKES MAGAZINE

CAPITOL ENGINEERING CORPORATION
Dillsburg, Pennsylvania

MR. GEORGE T. MCCOY
State Highway Engineer
Sacramento, California

DEAR MR. MCCOY: Every letter should have a purpose. This one has two.

First, I want to congratulate you upon your recent election to the first vice presidency of the A. A. S. H. O. This is a well-deserved honor.

Secondly, I want to express my appreciation to the person responsible for sending me the *California Highways and Public Works* magazine. This is the outstanding publication of its kind in the United States. As Chief Engineer of the State Road Commission of West Virginia, I received and enjoyed it regularly. As of July 1, 1952, I resigned to go to Paris, France, on three airport jobs for Capitol Engineering Corporation. After my return to this Country I was sent down here for preliminary work on a proposed toll highway between Dallas and San Antonio, and lost touch with your magazine. However, it recently began to appear again and I have greatly appreciated it.

With best wishes of the season to you and to Mr. R. H. Wilson, I am

Sincerely yours,

M. L. O'NEALE

FROM ARGENTINA

CORDOBA, ARGENTINA

California Highways and Public Works
Sacramento, California

GENTLEMEN: A few days ago the girl in charge of the library at the Direccion Provincial de Vialidad showed me an issue of *California Highways and Public Works* magazine, which I found very interesting.

The issue referred to is dated September-October, 1953, and it brings two articles about roadside planting and traffic studies that are not only informative, but exceedingly valuable as a reference work.

The Province of Cordoba has a road network of about 20,000 km. mostly built on natural soil. Apart from the national routes that bind the city with other important provinces, which are mostly paved, the province owns a good section of paved highways.

The writer is a highway engineer and would thank the editor if he were so kind as to send him regularly a copy of *California Highway and Public Works* magazine.

Yours sincerely,

F. TONOLI
Cordoba, Argentina

MORE POWER TO YOU

STOCKTON CHAMBER OF COMMERCE

STOCKTON, CALIFORNIA
March 1, 1954

MR. KENNETH ADAMS, *Editor*

DEAR MR. ADAMS: We were very much interested in the excellent article (FAS—Project—Pacific Avenue, San Joaquin County) by Clement Plecarpo in your January-February issue.

We would like to call attention to the fact that the 18-foot median strip has been landscaped with minimum maintenance plant material. This was done in one Arbor Day last November by the Lions Club of Stockton, which also purchased the plants. The saving to the Highway Department by cancelling proposed blacktopping of the median strip will maintain the project for a number of years.

The Lions Club and the County Highway Department deserve much credit for their splendid cooperation, making possible this safety and beautification planting on a major approach to Stockton.

Sincerely,

STOCKTON CHAMBER OF COMMERCE
CITY APPROACHES COMMITTEE
"GUS" SIMPSON, Chairman
BRUCE CRAVER, Secretary-Manager

Flared Guard Railing

Reduces Accidents at Bridge Approaches

By R. J. ISRAEL, Assistant Traffic Engineer

One of the principal methods which the California Division of Highways employs in its continuous effort to increase highway safety is the careful study of the effect of engineering improvements. The analysis by the division's Traffic Department first points the way toward the solution to a safety problem. After the solution has been applied, the traffic engineers study the location or locations concerned to see the extent to which the accident-producing condition has been alleviated.

An outstanding recent example of such before-and-after studies in evaluating the effect of an improvement of this type had to do with the installation of flared guard railing at the approach corners of substandard width bridges on a high-speed highway through desert country. When the figures were in and tabulated, they showed that this one device had reduced the over-all rate of accidents at bridge ends by 55 percent. With respect to fatal and injury accidents, the reduction was 68 percent.

This photo shows type of flared guard railing used at bridge approach

Bridge Accidents

The accident records maintained and analyzed by the Division of Highways show that a considerable number of mishaps involve vehicles running into the ends of bridge railings, particularly when the railings are set closer together than the out-to-out width of the shoulders on the approach to the bridge. In certain instances a specific bridge or other structure, because of a combination of factors, such as restricted approach sight distance plus narrow width, will be the focal point of a concentration of accidents.

Such "sore thumb" locations are not under consideration in this discussion. They are treated individually in the same manner as other points of high accident frequency, such as certain curves and intersections. Corrective measures are applied as determined by analysis of the accident pattern. What centered attention on the bridge-end problem in the desert area was the collective picture. Individually, these structures were involved in an average of less than one accident per year; collectively, there were so many of them so similar in nature that they demanded study and treatment.

Flared Guard Railings

It had long been recognized that a relatively inexpensive method of reducing bridge-end accidents in both number and severity was the installation of flared guard railing at the right-hand approach corners of the structure. Railings are set on a parabolic curve with the length determined by the width of the highway shoulder. For example, a six-foot offset between bridge curb and the edge of the shoulder calls for a 90-foot length of railing.

Accordingly, the Division of Highways had begun some time ago to install approach railings at the ends of bridges where the accident situation proved to be critical. In 1948 it was made design policy to provide such railing on all new structures whose width was less than that of the adjacent roadway and shoulders.

Before long it was apparent in a general way that there were fewer accidents involving bridge-ends. The improvement in safety at specific locations might be statistically evident, but it is usually not so easy to present a clear collective picture of the effect of a single type of corrective device at a number of different locations. This is because the individual accident locations may differ widely as to physical conditions, traffic volume or other important factors; these extraneous elements ordinarily make it difficult to measure the effect of a common corrective measure.

Bridges Studied

The Division of Highways' accident analysts were fortunate in this case, however. Data were available on a substantial number of approach guard railing installations on like-type structures all on a single highway route which present homogeneous conditions throughout its length.

The bridges chosen for study were those on U. S. 60-70 in the desert area of the easterly half of Riverside County. Approach guard railings had been installed as follows: 11 bridges in 1946, 8 in 1948, and 9 in 1949, a total of 28.

This stretch of highway is all two-lane, generally straight, and level or only slightly rolling. Traffic is fairly uniform as to volume throughout the length of the route studied, and the high percentage of through vehicles means that all structures carry substantially the same traffic. Speeds are generally high all along the route; there are no built-up areas or limited speed zones near any of the 28 bridges. Finally, all the bridges concerned are of the same design: timber trestle construction with timber curbs and railings. All of them have, within a few inches, the same roadway width —approximately 24½ feet.

Another bridge approach protected by flared guard railing

Period Covered

The total period covered by the study was from January 1, 1942, to July 1, 1951. This period included a factor which would tend to bias the results against the improvement. The pre-guard rail period included the years of gasoline rationing and the special 35-mile wartime speed limit. It is true that on this important interstate route traffic volumes were not materially reduced during the war; but the smaller percentage of nonprofessional drivers using it and the reduction of over-all speed should have resulted in lower accident rates during the portion of the "before" period. No effort was made to adjust for this factor; the total period of record was used in the study, in order to increase the size of the statistical sample.

Because of the previously mentioned uniformity of physical and traffic conditions, it was feasible to combine accident data for all 28 bridges. All of them were considered to have an equal accident potential; the only weighing done was on the basis of actual traffic and of the period of exposure—as noted, the "before" period ranged from four years to seven, with the "after" period varying accordingly.

Reported Accidents

During the years prior to the installation of the guard rail, the total traffic exposure on the group of bridges added up to 101.1 million vehicles. The "after" period, shorter in most cases, showed a total exposure of 50.0 million vehicles. The actual number of reported accidents in the respective periods is shown in the following table:

	Before period (101.1 M.V.)	After period (50.0 M.V.)
Fatal acidents	7	1
Injury accidents	31	5
Property damage accidents	20	7

To place the comparison on an equal exposure base, it is necessary to divide by the number of vehicles involved in the respective periods. Thus, the over-all accident rate per million vehicles in the pre-guard rail period was 0.574, as compared to a rate of 0.260 after the installations, making a reduction of 55 percent in the rate for all types of accidents at bridge-ends. For the fatal and injury accidents combined, the reduction was even more striking: from 0.376 per million vehicles before to 0.120 after, a reduction of 68 percent. It is noteworthy that while the casualty accidents during the "before" period outnumbered the noninjury accidents almost two to one, the noninjury mishaps actually exceed the more serious ones in the "after" period.

Cost of Installations

Guard rail tapered across the width of the shoulder at the bridge approach achieves this remarkable improvement in safety in two ways. Obviously, it is a distinct aid to visibility, particularly at night, and also serves as a general warning to the driver unfamiliar with the route that a situation requiring caution and added alertness lies ahead. It provides an extra cushion of safety against the special danger resulting from the combination of high speed and driver fatigue particularly prevalent on desert routes.

In addition, the railing acts to deflect into the proper lane a vehicle which is traveling too far to the outside of the roadway. Even though the vehicle may actually strike the guard rail, the damage will often be negligible. In the extreme case, a sideswipe crash into a flexible guard rail is considerably less likely to be lethal than a head-on crash into a solid bridge-end. The fact that property damage accidents show a smaller proportionate reduction in the "before" and "after" periods than the casualty accidents appears to bear out this observation.

The total cost of guard rail installations at the 28 bridges included in the study was $13,092.20, an average of $468 per bridge. These cost figures include, of course, the relatively high transportation expense and excessive travel time involved because of the relatively isolated locations of the structures.

Twenty-two railroad grade crossings were eliminated from the State Highway System during the 1952-53 Fiscal Year by construction, changes in highway alignment or abandonment of railroad tracks. Of the seven railroad grade separations completed during the year, five were new crossings on new alignment and two eliminated existing grade crossings.

Retirements *from* Service

Richard A. Tremper

Richard Arthur Tremper with over 41 years of service with the Division of Highways was honored at a retirement dinner given in his honor at the New Tivoli Restaurant in San Francisco. The event was attended by more than 100 of his close friends and co-workers.

RICHARD A. TREMPER

"Tremp" was born in Stockton, California, on December 16, 1887. He attended school in both Stockton and Santa Rosa. He began his employment as a rodman for District II in 1912 and progressed steadily within the organization through the various grades of employment as instrumentman, levelman, chief of party, location engineer, resident engineer, highway maintenance superintendent, assistant district maintenance engineer and district maintenance engineer.

Through his steady progress in District II from the very start of the organization until the present his work and counsel were very definitely considered assets to the Division of Highways. Since "Tremp's" main family ties remained in the Bay area he obtained a transfer to District IV in 1949 and he was one of the valued employees of District IV Maintenance Department since that time. This is no better explained or exemplified than by the late District Highway Engineer Fred W. Haselwood's letter to this district upon Mr. Tremper's transfer which read as follows:

"Mr. Tremper has very ably filled a vital role in our Maintenance Department for a number of years, and although we will regret losing his services, we will not stand

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Alexander N. Lund

On January 1, 1954, Al Lund retired from the Division of Highways, thus terminating a 32-year career, 18 years of which were spent in District X.

On November 5, 1953, a party of 225 of Al's friends from all over California gathered in Stockton to bid him good-bye. District engineers, contractors' representatives and other friends made up the group which was presided over by Cliff Temby as master of ceremonies. All previous speaking records were broken by Al when he talked for 62 seconds.

ALEXANDER N. LUND

Born Alexander Nelson Lund on December 28, 1888, in Dresden, Yates County, New York, Al, as he is known to all, went through grammar and high school in Ovid, New York, and graduated from the University of Michigan in 1911, receiving a B.S. in engineering.

Served Overseas

Employed by the U. S. Bureau of Reclamation and the Great Northern Railroad Company after graduation, he quit to join the armed forces in 1917 and served overseas for two years.

Returning in 1919, Al worked on several projects up and down the State of California, finally joining the Division of Highways as instrumentman on May 7, 1922.

In October, 1923, he transferred to District VI as assistant superintendent on the Yosemite All-Year Highway between Briceburg and El Portal. He was destined to rebuild this stretch

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D. C. Willett

Daniel Clinton Willett celebrated his 34th anniversary as a member of the Department of Public Works by retiring February 11, 1954. Willett, chief construction engineer, had been in charge of all construction, structural engineering, maintenance survey and repair of state buildings and of the schoolhouse activities of the Division of Architecture for the last seven years.

D. C. WILLETT

Willett was born in Kentucky March 6, 1893. He attended parochial schools in Henderson and Ritnor Elementary and High School in St. Louis, Missouri. He was graduated from the Christian Brothers College in St. Louis in 1915 with the degree of bachelor of science in civil engineering.

Came West in 1920

During the summer of 1914 Willett was employed as draftsman and engineer for T. C. Lee, Architect, of St. Louis, and following graduation he practiced architectural design at the Ritnor School and the Overland Bank Building in St. Louis County.

In June, 1915, he entered the employment of the Missouri, Kansas, and Texas Railroad at Parsons, Kansas, in the chief engineer's office. It is of interest that Willett took a job in the office in which Highway Bridge Engineer F. W. Panhorst had worked the previous fall when the office was in St. Louis.

From February, 1915, to January, 1920, Willett worked successively for the Rock Island Railroad; the Missouri Pacific Railroad, in the Standards Department; the U. S. Department of Interior Reclamation Service, as struc-

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Leo E. Robinson

On December 31, 1953, Leo E. Robinson, Highway Foreman in District II, retired after 31 years of service in the Division of Highways.

Robinson was born on December 6, 1890, in the San Felipe Valley in Santa Clara County, moving to Shasta County in 1921.

Ed started work with the Division of Highways in District II on October 10, 1921, driving a four-mule team hitched to a Fresno scraper on Hatchet Mountain on Highway 299 east of Redding. This was on a day labor construction project under the supervision of F. C. Macaulay. This first employment terminated November 4, 1921. He was employed again on this project on November 21, 1922, and worked until the camp was closed on April 25, 1924. In the winter of 1922-1923 he was given the task of keeping the snow off the Burney side of Hatchet Mountain, using horses and a small grader. In the spring of 1923 he was promoted to truck driver and has many interesting experiences to tell of the old solid tire trucks left over from World War I.

Started in 1924

Robinson's permanent service started on August 8, 1924, as a truck driver in District I at Willits, but he was transferred back to District II on September 23d, and has worked in that district since that time.

Ed was made Acting Maintenance Foreman in 1925, gaining a permanent rating in 1931. He has served in this capacity since, and the last 17 years has been in charge of Highway 44 from Redding to Lassen Park.

A pot luck dinner at the Redding Maintenance Station was given on January 3, 1954, for him by his fellow employees, who wished him a lot of pleasure in his future plans and also presented him with a watch.

Mr. and Mrs. Robinson are buying a trailer and expect to travel. This year they plan only short trips and two months fishing on Hat Creek near Lassen Park. Next year they plan a two-year swing around the Country visiting Southern California, Texas, Mississippi, Florida, the Great Lakes and Yellowstone Park.

Frank A. Johnson

Completing 21 years of state service, Frank A. Johnson, Principal Structural Engineer of the Division of Architecture, has retired.

He is a native son, having been born in San Francisco, California, August 22, 1888. He attended high school at California School of Mechanical Arts (Lick School). Since March, 1906, one month prior to the San Francisco earthquake and fire, he has been actively engaged in the structural engineering profession in California. He attended University of California, College of Civil Engineering. In 1917 he served in the United States Army.

FRANK A. JOHNSON

During the period September, 1922, to June, 1933, Mr. Johnson had varied employment in the structural design field. In June, 1933, he entered the service of the State of California, Division of Architecture. The first nine years of this state service was in Southern California as supervising structural engineer in the administration of the "Field Act," which was enacted into law in 1933 to assure proper and safe construction of public school buildings in California. He was one of three engineers in Southern California who were selected to formulate policies and to initiate the Division of Architecture procedure in the checking of design and plans for schools under the provisions of the Field Act, immediately subsequent to the Long Beach, California, earthquake of March, 1933.

During his career, Mr. Johnson has participated in the structural design and construction of many structures, among which are the Balfour Guthrey Building, American National Bank Building and the Standard Oil Building in San Francisco.

He retires with the grade of principal structural engineer in charge of the structural design of all structures constructed by the Division of Architecture. This building program ex-

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Harry W. Bolin

After 20 years of service with the Division of Architecture, Harry William Bolin of Northridge, San Fernando Valley, retired on January 15, 1954.

Bolin had been area supervisor of the Schoolhouse Section in Southern California since 1934 with the rank of principal structural engineer since 1948, except during 1943 and 1944 when he handled special assignments for the U. S. Navy.

Bolin was born March 15, 1888, in Muskegon, Michigan, the son of August and Caroline (Johnson) Bolin. He was graduated from the University of California at Berkeley in 1913 with the degree of bachelor of science in civil engineering. He was employed as a structural designer and engineer by H. J. Brunnier of San Francisco from 1913 to 1924 with the exception of a World War I period when he was in service in France with the 23d U. S. Engineers, First Army. From 1925 to 1926 he was the manager of the Engineering Department of the J. E. Hayes Corporation at Shanghai, China, and from then until 1933, was a consulting structural engineer at Oakland, California.

He was employed by the Division of Architecture in 1933 as a structural engineer and that year became office engineer in charge of the Los Angeles Area Schoolhouse Office. In 1944 he was placed in charge of the activities of the Los Angeles Area Office, with the rank of supervising structural engineer until 1948 when he was promoted to principal structural engineer.

Bolin is a member of the Structural Engineering Association of California and served as its president in 1950. He is a member of the Structural Engineering Association of Southern California and served as its president in 1949. He is a member of the American Concrete Institute, the Earthquake Engineering Research Institute, the American Society of Civil Engineers, and served as chairman of the Seismology Committee of the American Society of Civil Engineers from 1940 to 1950.

Buren Thorleifson

On December 29, 1953, Buren Thorleifson, Construction Supervisor II, Division of Architecture, was honored with a dinner given for him by his fellow workers at the Turf Club in Rivera on the day preceding his retirement after 15 years of service with the State.

BUREN THORLEIFSON

Thorleifson was born May 4, 1885, on the Island of Sjaelland, Denmark, and was educated in the Technical School in Copenhagen, majoring in construction engineering. In 1907 he was employed by the Government of the Republic of Chile as building inspector and supervised the construction of the Naval Academy at Valparaiso and the customs office at Santiago.

Come to California in 1910

In 1910 he decided to leave this position and go to Australia. However, he came to the United States instead, landing at San Francisco in the fall. Inasmuch as he could speak no word of English, he decided to go to Fresno where there was a Danish colony. During the years 1910 to 1912, he was employed at Fresno by the California Wine Growers Association. After this he again went into the construction business, working in Chicago; Bridgeport, Connecticut; Racine, Wisconsin; and other places.

Worked in Detroit

He returned to California in 1921 and was employed by Darrell-Condley Company for two years and then went into business for himself from 1925 to 1929. From 1929 to 1931 he worked for Stone and Webster as estimator on the Rock Island Dam project in the State of Washington, after which he again returned to California, working for Robert E. McKee, and was then employed by the U. S. Public Works Administration.

In 1938 he entered state service as inspector for the Contractor's License

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Frank W. McManus

Frank W. McManus, Assistant Equipment Engineer of the Division of Highways, retired of as March 5, 1954, after 33 years of service. The Capitol Inn near Sacramento was the scene of a testimonial luncheon given for him on March 6, 1954, with about 125 friends and colleagues present.

FRANK W. McMANUS

"Mac" was born in Sacramento on June 11, 1886, son of George and Lucy McManus, early residents of this city. He graduated from local schools. Some of his earlier positions were with the Southern Pacific Company in 1902 where he advanced to the status of draftsman; then to Sacramento County for about three years (1906-09), working on county roads when the Auburn, Franklin, Stockton, Jackson and Mills roads were first built to highway standards. He also surveyed several subdivisions for the City of Sacramento and later operated his own private practice.

Army Service

McManus served in the National Guard and was stationed along the Mexican border prior to being inducted into the regular army during World War I. He was married in Tucson, Arizona, in 1917 to Maude Annereaux of Sacramento. Upon returning to Sacramento, he was associated with the Liberty Iron Works as an aeronautical engineer, doing experimental work on airplane design. Following this period in his career he built and flew airplanes until July, 1921. At that time he went to work for the State as draftsman and in May, 1922, transferred to the Equipment Department of the Division of Highways as junior equipment engineer and progressed to associate equipment engineer in October of 1951. In the latter position, he was in charge of requisitions for repair parts for some 6,000 construction and maintenance units.

"Mac" is a Mason, becoming a member of Washington Lodge No. 20, in 1917-18. He sold his "ranch" located in the Del Paso Heights region, recently, and is now living in Sacramento during the construction of a new home in Carmichael.

"Mac" and Mrs. McManus plan on buying a house trailer for an extended tour. He will be greatly missed by his fellow employees and many friends while he is on tour.

FRANK A. JOHNSON

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ceeds $50,000,000 in construction projects annually. In this present work, Mr. Johnson has been affiliated with such structures as the State Highway Building in San Francisco, the Business and Professions Building Annex, the Public Works Annex, the State Department of Education Building, the Motor Vehicle Building and the State Capitol Annex, all of Sacramento. He had charge of structural design for the proposed Department of Employment Building, a structure of approximately $10,000,000 in cost. Also, he has been responsible for the structural design of all buildings of the new Sacramento State College. His successor will be Charles Peterson of Sacramento.

Mr. Johnson is a registered civil engineer in the State of California with authority to use the title of structural engineer. He is a life member of the American Society of Civil Engineers and an honorary member of the Sacramento Chapter of that society. He is married. His wife was formerly Abby Gibson of Berkeley. He has two daughters and six grandchildren.

By adding a separate power unit to conventional farm machine rotary weed beaters the Division of Highways Equipment Department has improved their efficiency in roadside weed eradication. The beater is pulled by a small tractor and the mounted engine eliminates the necessity of a power take-off.

D. C. WILLETT

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tural designer at El Paso, Texas; the American Smelter and Refining Company, Mexican Division, where he assisted in the redesign and reconstruction of the Chihuahua and Monterey Smelters in northern Mexico; the Illinois State Highway Commission, as office engineer, East St. Louis Division; and for St. Louis County, Missouri, as assistant highway engineer.

On November 27, 1915, he married Florence C. Fuchs, who had formerly worked as a stenographer for the California State Compensation Insurance Fund. The new Mrs. Willett strongly desired to return to California and did her best to persuade Willett to come west, which he finally did in 1920.

In Bridge Department

Willett was employed by the Division of Highways February 20, 1920. He worked for the Highway Bridge Department until 1921 when he was borrowed by the Division of Architecture to check the plans of the Printing Plant at 11th and O Streets and later to act as construction superintendent. He was recalled by Highways on April 27, 1923, and was appointed Office Engineer of the Bridge Department with the class of Structural Engineer V, equal to our present-day supervising structural engineer, a rank which he held for 20 years. In 1924 he was assigned to field work, handling construction of bridges all over the State. Among his most important jobs was the supervision of the construction of the Ventura Seawall.

Returns to Architecture

In January, 1927, Willett again returned to architecture; this time permanently, as assistant to C. H. Kromer, Principal Structural Engineer. On November 1, 1931, Willett's class of Structural Engineer V was retitled Supervising Structural Engineer.

Probably the most important contribution of Willett's long and rich public service is his virtual authorship of the California Earthquake Safety Law, popularly known as the Field Act. On the occasion of the Long Beach earthquake March 10, 1933, State Architect George B. McDougall sent C. H. Kromer down to Long Beach for a look at the damage. The Legislature was in session and the late Assemblyman C. Don Field of Glendale asked State Architect McDougall for a meeting with a legislative committee to discuss legislation which would seek to prevent the repetition of the serious damage sustained by many of the buildings in Los Angeles-Long Beach Area. That morning Willett had taken up a suggestion by the late Fred Green, a structural engineer with the Division of Architecture and, using the Dam Act as a model, had written up a proposed bill which he discussed in a conversation with Assemblyman Field. Field introduced the bill to the Assembly where it was passed unanimously.

Field Act Becomes Law

The bill passed the Senate and was signed by Governor Rolph on April 10, 1933. This act has since been the basis of construction of all public schoolhouse structures in the State of California up to and including the junior college level. The efficiency of this act has been demonstrated many times. No school erected in California since the adoption of the Field Act and under its rules has suffered damage more severe than a minor crack in the plaster in the Bakersfield earthquake in 1952. Willett has been in charge of administering this act for the ensuing 21 years.

Immediately after the adoption of the Field Act in April, 1933, Willett went to Los Angeles where he set up the Division of Architecture, Schoolhouse Section, in that city. He headed this office until December of that year when he returned to Sacramento. He left the Los Angeles office under Harry W. Bolin as office engineer with Julius Stafford and Frank A. Johnson as district engineers assigned to field checking of construction. It is interesting to note that both Bolin and Johnson are retiring within one month of Willett. On the retirement of Kromer in 1939 Willett assumed the additional duties of head of the Structural Engineering Section. He was advanced to the grade of principal structural engineer after Anson Boyd became State Architect.

In 1947 Willett was appointed Chief Construction Engineer and assumed charge of, besides the Schoolhouse and Structural Engineering Sections, the Construction Section, including all of the work performed by the Division of Architecture in the field. In 1949 the Maintenance Survey and Repair Section was put under Willett's jurisdiction.

Willett is a member of both the Northern and Central California Chapters, and was the first president of the Central California Chapter, of the Structural Engineering Association of California. He holds Registration No. 55 as Structrual Engineer and Civil Engineering License No. 568 in the State of California.

Schoolhouse Construction

Since 1933 Willett has been responsible for construction of $1,244,177,-291 in public schoolhouses which includes 11,570 projects as of January, 1954, and since 1947 has been responsible for construction amounting to $244,429,171, which includes 2,222 work orders covering more than 400 sites in every county in the State except Alpine. Of this amount, $133,-055,210 has been completed in the field while $111,373,961 is currently under construction. Combining state institution work and public schoolhouse work, Willett has, during his 34 years with the State, been in charge of one and one-half billion dollars worth of construction, which includes almost 14,000 separate projects.

Although Willett is retiring from active administration, he plans to remain interested in the work of the Division of Architecture. He has outlined a five-year period of travel during which he intends to inspect construction of all types in every part of the globe, taking notes, pictures, and absorbing technical information.

PUYALLUP VALLEY

Puyallup Valley in Washington State is reported by the National Automobile Club to grow four times as many daffodil bulbs as are imported from Holland each year.

Earl S. Wise

After completing 25 years of continuous service with District V of the Division of Highways, Associate Highway Engineer Earl S. Wise retired effective March 11, 1954. During the early part of this quarter century of service Earl accomplished many different assignments for the district. During the last part his work has been entirely with the Design Department, and the results of his work can be observed throughout all of District V.

EARL S. WISE

Earl was born on a farm near Lansing, Michigan, of English parents on December 1, 1888. His elementary education was obtained in that vicinity, and while he does not claim to be a football player, he attended Michigan State College for two years. It was during this period that Earl obtained his first taste for highway work, as he spent his summer vacations working for the Ingham County Highway Department out of Lansing.

U. C. Graduate

In 1925, becoming tired of the blessings of bachelorhood, Earl traveled to Regina, Saskatchewan, to claim his childhood sweetheart, Fern Moynan, as his bride. Immediately after the marriage, the couple moved to California to reside permanently.

Earl at this time completed his college education by enrolling at the University of California at Berkeley where in 1928 he obtained the degree of Bachelor of Science in Electrical Engineering. After graduation he received an offer of employment as draftsman from the San Luis Obispo office of the Division of Highways. Having had prior experience in highway work, the offer was accepted, and on December 17, 1953, 25 years of continuous service with the State of California and District V of the Division of Highways was completed.

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George Farnsworth

On January 29, 1954, open house for associates and friends was held in George E. Farnsworth's offices to celebrate his retirement from state service, that became effective February 1, 1954. Upon this occasion he was presented with a big cake dramatically showing in colored icing a section of freeway and inscribed with the words, "Thanks for helping build them."

GEORGE E. FARNSWORTH

George, born in Blair, Nebraska, on January 16, 1884, had reached the age of 70 after having completed more than 20 years' service with the State Division of Highways the major portion of which was in District VII. For the past several years George had been the Senior Highway Engineer in charge of the important section of the district office engineer's organization which has responsibility for status of contract reports, progress pay estimates to contractors, and preparation of engineer's estimates of costs for all preliminary reports of proposed construction.

University of Nebraska Graduate

He obtained his engineering training at the University of Nebraska where he graduated with a B.S. in Civil Engineering in 1904. It is interesting to note that George was a freshman at the University when Spencer V. Cortelyou, retired Assistant State Highway Engineer formerly in charge of District VII, was a senior and playing on the varsity football team of that year earned the title of All-American right end. The "Cornhuskers" still have staunch supporters on the District VII staff, headed by none other than the top man of the district, Paul O. Harding, University of Nebraska, 1922.

Between the time of his graduation and his coming to the State Division of Highways, George had extensive and varied railroad and highway engineering experience in Mexico and in Ore-

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Ben Henry

After almost 41 years of continuous service with the State, excepting one year in the military service during 1918-1919, Ben Henry of District VII retired on March 31, 1954. A dinner attended by approximately 100 close friends and coworkers was given in his honor on March 26th.

BEN HENRY

Ben started work with the State Division of Highways on August 5, 1913, in District I. After two years there as instrument man he transferred to District II. While there he served as chief of party on location of the Feather River Highway, also as resident engineer on construction, and later as superintendent of construction camps operated with prison labor. He later became District Construction Engineer in District II.

In 1930 he transferred to District V as superintendent of the prison camp at San Simeon. In August, 1935, he transferred to District VII to take over superintendency of the newly established Angeles Crest Camp. Due to World War II this camp was closed in September, 1942, and Ben became Assistant District Maintenance Engineer and served in this capacity until retiring, with the exception of the year he again served as superintendent of the Angeles Crest Prison Camp in 1946.

Ben was born on March 12, 1891, near Elko, Nevada. He moved to California in 1909. Prior to entering state service he was engaged in railroad engineering.

Ben's plans after retirement include trips to faraway places as well as trips over the many miles of state highways in California that he has helped develop from wagon roads to high speed expressways. His base of operation will be his home at 1352 Salisbury Road in La Canada. All who have known and worked with Ben Henry wish him many enjoyable years of a well-earned retirement.

HIGHWAY BIDS AND AWARDS

January, 1954

ALAMEDA COUNTY—In the City of Oakland on Seventh between Broadway and Cypress Streets, about 1.1 miles in length, to be planed and resurfaced with plant mixed surfacing. District IV, Route 69. Ransome Company, Emeryville, $42,392; Gallagher and Burk, Inc., Oakland, $45,200. Contract awarded to Independent Construction Company, Oakland, $41,785.

EL DORADO COUNTY—Between west city limit of Placerville and 0.2 mile east of Washington Street Overhead, about 13 miles of four-lane divided highway to be graded, two pedestrian overheads and three bridges to be constructed and three bridges to be widened. District III, Route 11, Section C. Fredrickson and Watson Construction Company and M and K Corporation, Oakland, $874,719.90; Granite Construction Company, Watsonville, $884,763; Gordon H. Ball and San Ramon Valley Land Company and John Delphia, Berkeley, $895,100.94; Eaton and Smith, San Francisco, $911,377.70; H. Earl Parker Inc., Marysville, $920,837.50; Lew Jones Construction Company, San Jose, $930,815.90; B. J. Ukropina, T. P. Polich, Steve Kral and John R. Ukropina, San Gabriel, $969,463.50; Nomellini Construction Company, Stockton, $1,099,067.75; Charles MacClosky Company and Clyde W. Wood and Sons Inc., Los Angeles, $1,166,262.50; A. Teichert & Son Inc., Sacramento, $1,218,726. Contract awarded to Piombo Construction Company, San Francisco, $809,970.

FRESNO COUNTY—At the intersection of U. S. 99 with Cherry Avenue in the City of Fresno, channelization to be constructed and highway lighting to be furnished and installed. District VI, Route 4. Stewart & Nuss, Inc., Fresno, $34,939; Paul E. Woof, Fresno, $35,365; Gene Richards, Inc., Fresno, $37,281; George C. Ranz Construction Co. Inc., Gilroy, $44,256; Stanfield and Moody, Tracy, $46,831; Baun Construction Co., Fresno, $46,974. Contract awarded to Thomas Construction Co., Fresno, $34,160.

LOS ANGELES COUNTY—At the Ramona Freeway, Santa Ana Freeway interchange in the City of Los Angeles, a bridge to be constructed, about 0.29 mile of approaches to be graded and paved with plant-mixed surfacing, and about 0.14 mile of additional freeway to be regraded and paved with Portland cement concrete. District VII, Route 26.2. J. E. Haddock, Ltd., Pasadena, $494,458.50; George W. Peterson and Jack W. Baker, Los Angeles, $512,514; Webb & White, Los Angeles, $569,968.50; Byerts and Sons, and George K. Thatcher, Los Angeles, $596,454.50; Bongiovanni Construction Company, Los Angeles, $671,809.90. Contract awarded to Charles MacClosky Company, Los Angeles, $465,443.

LOS ANGELES COUNTY—Between Todd Avenue and Pioneer Boulevard on the Santa Ana Freeway, about five miles in length of roadside areas to be planted and median strip to be surfaced with plant-mixed surfacing. District VII, Route 166, Section A. Henry C. Soto Corporaiton, Los Angeles, $39,795.15; K. E. C. Company, Inc., Long Beach, $45,584.21; Jannoch Nurseries, Altadena, $45,593; Justice Dunn Co., Oakland, $53,730.50. Contract awarded to Huettig, Schromm & Bennett Inc., Palo Alto, $39,034.60.

LOS ANGELES COUNTY—At the intersections of Redondo Beach Boulevard with Inglewood Avenue and of 174th Street with Redondo Beach Boulevard-Grevillea, Hawthorne Boulevard, Prairie Avenue, Crenshaw Boulevard, Western Avenue and Normandie Avenue, traffic signal systems and highway lighting to be furnished and installed. District VII, Route 175, Section RdeB, Tor, Gar, A. Electric & Machinery Service Inc., South Gate, $87,088; C. D. Draucker Inc., Los Angeles, $88,757; Westates Electrical Construction Co., Los Angeles, $88,980. Contract awarded to Fischbach and Moore, Incorporated, Los Angeles, $85,477.

NAPA COUNTY—Placing sacked concrete riprap on channel change under Br. No. 21-77, Cayetano Creek, and constructing metal plate guard railing at approaches to bridge 0.4 mile east of Napa city limits. District IV, Route 8, Section B. Arthur B. Siri Inc., Santa Rosa, $8,226; O. C. Jones & Sons, Berkeley, $10,200; James W. Hill, Walnut Creek, $10,827; Bos Construction Company, Berkeley, $12,790; McGuire & Hester, Oakland, $13,700; J. Henry Harris, Berkeley, $18,071. Contract awarded to Baldwin Contracting Company, Inc., San Rafael, $7,991.

ORANGE COUNTY—On Santa Ana Freeway from Red Hill Avenue to First Street, highway lighting and illuminated sign system to be furnished and installed; a temporary traffic signal system to be relocated and removed. District VII, Route 2, Section C. Fus. SA. Electric & Machinery Service Inc., South Gate, $86,120; J. M. Mathes, Bell Gardens, $87,133; C. D. Draucker, Inc., Los Angeles, $89,424; Westates Electrical Construction Company, Los Angeles, $90,024; Fischbach and Moore, Incorporated, Los Angeles, $97,092. Contract awarded to Newbery Electric Corporatien, Los Angeles, $82,720.

RIVERSIDE COUNTY—Across Olsen Ditch, about 42 miles west of Blythe, a reinforced concrete slab bridge to be constructed. District XI, Route 64, Section C. Fred D. Kyle, Pasadena, $23,078; O. B. Pierson, Bellflower, $23,153.80; Louis J. Strona, Pomona, $24,808.50; E. S. & N. S. Johnson, Fullerton, $24,970; Owl Truck and Construction Co., Compton, $25,775; Byerts & Sons, Los Angeles, $29,325. Contract awarded to C. B. Tuttle, Los Alamitos, $21,494.

SACRAMENTO COUNTY—At the intersection of Folsom Boulevard with 65th Street, in and adjacent to the City of Sacramento, traffic signal system and highway lighting to be furnished and installed and channelization to be constructed. District III, Routes 11, 98, Section B,A. Brighton Sand & Gravel Company, Sacramento, $22,512; J. R. Reeves, Sacramento, $23,200.75; A. Teichert & Son Inc., Sacramento, $23,726.85. Contract awarded to McGillivray Construction Company, Sacramento, $21,720.86.

SAN BERNARDINO COUNTY—Between east city limits of Redlands and Live Oak Canyon Road, about 2.9 miles to be resurfaced with plant mixed surfacing. District VIII, Route 26. Ralph B. Slaughter, Julian, $53,945; Matich Brothers, Colton, $57,060; George Herz & Co., San Bernardino, $58,160; E. L. Yeager Co., Riverside, $61,830; R. A. Erwin, Colton, $62,875. Contract awarded to G. W. Ellis Construction Co., North Hollywood, $53,190.

SANTA BARBARA COUNTY—Between Gaviota and 0.5 mile north of Las Cruces, about 4.2 miles in length of roadside areas to be prepared and planted. District V, Route 2, Section E. Justice Dunn Co., Oakland, $22,355.60; Huettig, Schromm & Bennets Inc., Palo Alto, $22,584.70; Diablo View Gardens, Antioch, $23,029.25; Watkin & Sibbald, San Anselmo, $25,684; K. E. C. Company, Inc., Long Beach, $29,722; James E. Boothe, Compton, $37,197.65. Contract awarded to Rudolph Watson, San Mateo, $19,925.70.

SANTA CLARA COUNTY—At the intersection of West San Carlos Street with Meridian Road, in and adjacent to the City of San Jose, traffic signal system to be furnished and installed and channelization to be constructed. District IV, Route 5, Section B. Joe W. Douglass, San Jose, $19,049; Howard Electric Co., Gilroy, $19,309; L. C. Smith Co., San Mateo, $19,724; J. C. Bateman Inc., San Jose, $20,746.30; Donald Graves, San Jose, $21,733; J. Henry Harris, Berkeley, $22,669. Contract awarded to A. J. Raisch Paving Company, San Jose, $18,949.

SISKIYOU COUNTY—Across the Klamath River at Walker, an existing steel truss and timber trestle bridge to be reconstructed and approaches to be graded and bituminous surface treatment applied thereto. District II, Route 46, Section D. James B. Allen, San Carlos, $39,773; Underground Construction Co., Oakland, $45,380; R. E. Hertel, Sacramento, $47,947; Bos Construction Co., Berkeley, $53,583. Contract awarded to James H. McFarland, San Francisco, $32,627.

SOLANO AND YOLO COUNTIES—At the junction of U. S. 40 with new U. S. 99W and at the Woodland Wye west of Davis, highway lighting and illuminated sign systems to be furnished and installed. District III, Routes 6, 7, Section I,A. R. Gould & Son, Stockton, $20,093; Karl E. Stolting, Santa Rosa, $21,090; Grason Electric Co., Sacramento, $21,159; L. H. Leonardi Electric Construction Co., San Rafael, $21,262; Hall Sloat Electric Co., Inc., Oakland, $21,595; Tuppen & Hawley Inc., Sacramento, $22,004; Collins Electric Company, Inc., Stockton, $22,222.22; Reliable Elevator Works, Sacramento, $22,491; R. Flatland, San Francisco, $23,650; Foothill Electric Corporation, Oakland, $24,700; Ed Pierce Electric Company, Vallejo, $25,409; Underground Electric Construction Company, Oakland, $25,683; Sacramento Electric Works, Sacramento, $31,349.60. Contract awarded to Howard Electric Company, Gilroy, $15,993.

SONOMA COUNTY—At Adobe Creek, Ellis Creek and Stage Gulch Creek, between three and five miles east of Petaluma, three existing bridges to be reconstructed. District IV, Route 104, Section D. John Carcano, San Rafael, $22,378.55; Charles S. Moore, San Jose, $22,468; Baldwin Contracting Co. Inc., San Rafael, $23,618.50; E. A. Forde Co., San Anselmo, $23,924.50; James W. Hill, Walnut Creek, $24,302.25; Robert R. Murdock, San Jose, $24,373.50; W. J. Kubon, San Rafael, $24,483.75; M. Erickson & Co., Napa, $25,073.50; Brown-Ely Co., Contractors, El Cerrito, $26,100.50; Morison Construction Co., and Ted Schwartz, Grass Valley, $26,379.50; C. S. Phillips, Petaluma, $27,447.05; Arthur B. Siri, Inc., Santa Rosa, $29,298.25; Helwig Construction Co., Sebastopol, $29,702.50; R. G. Clifford and C. O. Bodenhamer, Berkeley, $30,813.50; J. Henry Harris, Berkeley, $31,172.20; Bos Construction Co., Berkeley, $31,663; James B. Allen, San Carlos, $33,574. Contract awarded to James H. McFarland, San Francisco, $20,853.75.

TEHAMA AND SHASTA COUNTIES—At the intersections of Main Street with Oak Street in Red Bluff and Route 3 with North Street and South Street in Anderson, traffic signal systems to be furnished and installed and channelization to be constructed. District II, Routes 3,7. Hall Sloat Electric Company Inc., Oakland, $42,729; Underground Electric Construction Company, Oakland, $43,312. Contract awarded to Collins Electrical Co., Inc., Stockton, $38,867.

February, 1954

FRESNO COUNTY—In City of Fresno on Ventura Avenue, various locations between Hazelwood Boulevard and Orange Avenue, left turn lanes to be graded and surfaced with plant-mixed surfacing on untreated rock base. District VI, Route 41. Gene Richards Inc., Fresno, $6,026.50; Volpa Brothers, Fresno, $6,631.50; Baun Construction Company, Fresno, $7,181; Saginaw Construction Company, Selma, $7,479.50; Thomas Construction Company, Fresno, $7,879. Contract awarded to Stewart & Nuss Inc., Fresno, $5,550.90.

FRESNO COUNTY—Regrading State Highway between 0.6 mile and 0.8 mile east of Academy Avenue on Kings Canyon Road, roadway to be regraded and surfaced with bituminous surface treatment. District VI, Route 41, Section S. Paul E. Woof, Fresno, $2,992; Saginaw Construction Company, Selma, $3,260; Stewart & Nuss Inc., Fresno, $3,426; Gene Richards, Inc., Fresno, $3,575.50; Thomas Construction Company, Fresno, $3,868; Petroleum Sales Division, Fortier Trans. Company, Fresno, $4,162.35. Contract awarded to Baun Construction Company, Fresno, $2,587.

LOS ANGELES COUNTY—Between Cahuenga Boulevard and Gower Street about 0.6 mile in length of roadside areas to be prepared and planted. District VII, Route 2. K. E. C. Company, Inc., Long Beach, $43,313.55; Stephen L. Vistica, San Mateo, $43,360.42; James E. Boothe, Compton, $46,339.38; Justice Dunn Company, Oakland, $47,756.68. Contract awarded to Jannoch Nurseries, Altadena, $42,208.93.

LOS ANGELES COUNTY—On Foothill Freeway, between Hampton Road and Montana Street, a four lane divided highway with frontage roads and connections to be graded and surfaced with plant mixed surfacing and six reinforced concrete bridges, and a reinforced concrete equestrian tunnel to be constructed. District VII, Route 9, Section B, Pas. J. E. Haddock Ltd., Pasadena, $1,887,647.25; Guy F. Atkinson Company, Long Beach, $1,930,139; Vinnell Company, Inc. and Subsidiaries—Vinnell Constructors, J. V., Alhambra, $1,946,231.20; Peter Kiewit Sons' Company, Arcadia, $2,014,761.60; B. J. Ukropina, Polich, Kral and John R. Ukropina, San Gabriel, $2,042,156; Granite Construction Company, Watsonville, $2,063,065; Winston Bros. Company, Monrovia, $2,066,798.40; A. Teichert & Son, Inc., Baldwin Park, $2,112,686.80; Charles MacClosky Company and Kirst Construction Company, Los Angeles, $2,124,688.65; Vido Kovacevich Company and O. B. Pierson, Rosemead, $2,174,303.98; J. A. Thompson & Son, Inglewood, $2,184,005.80; Clyde W. Wood & Sons, Inc., and R. M. Price Company, North Hollywood, $2,189,445.50; Gordon H. Ball & San Ramon Valley Land Company and Eaton & Smith, Berkeley, $2,223,733.40; Webb & White, Los Angeles, $2,258,737.10; Griffith Company, Los Angeles, $2,293,220.50; Oberg Bros. Construction Company, Inglewood, $2,296,151.50. Contract awarded to George W. Peterson, Jack W. Baker & Dragline Rentals Company, Los Angeles, $1,831,071.

LOS ANGELES COUNTY—On Lincoln Boulevard between Olympic Boulevard and Santa Monica south city limits in the City of Santa Monica, traffic signal systems and highway lighting to be modified. District VII, Route 60. Electric and Machinery Service Inc., South Gate, $86,216; A. S. Schulman Electric Company, Los Angeles, $91,800; C. D. Draucker Inc., Los Angeles, $93,455. Contract awarded to Westates Electrical Construction Company, Los Angeles, $84,833.

MARIN COUNTY—Between Tamalpais Road and Muir Beach, portions about 0.1 mile in length to be graded and surfaced with plant mixed surfacing on untreated rock base. District IV, Route 56, Section A. Brown-Ely Company, Contractors, El Cerrito, $13,043.50; J. Henry Harris, Berkeley, $14,240.50; O. C. Jones & Sons, Berkeley, $16,815; A. A. Edmondson, Butte City, $18,198. Contract awarded to Ghilotti Bros. Inc., San Rafael, $10,184.

MENDOCINO COUNTY—Across Caspar Creek, about six miles south of Fort Bragg, a timber bridge to be redecked. District I, Route 56, Section E. Transocean Engineering Corporation, Hayward, $56,603; Eaton & Smith, San Francisco, $58,058; H. H. Anderson, Hayward, $58,129; Stanley H. Koller Construction, Crockett, $58,513.50; Payne Construction Company, Oakland, $59,695.76; Charles S. Moore, San Jose, $63,430; B. C. Clifford & C. O. Bodenhamer, Berkeley, $63,700; W. J. Kubon, San Rafael, $64,345.60; James B. Allen, San Carlos, $64,466; Morison Construction Company and Ted Schwartz, Grass Valley, $66,640; James H. McFarland, San Francisco, $67,644.50; Baldwin Contractor Company, Inc., San Rafael, $67,938.85; Humboldt Construction Inc., Eureka, $73,876; Hart & Hynding, Inc., San Francisco, $75,280; E. S. & N. S. Johnson, Fullerton, $83,036; Bos Construction Company, Berkeley, $83,391; LeBoeuf Dougherty Contracting Company, and Erickson & Pierson, Richmond, $93,792. Contract awarded to Bishop Younger Bradley Company, San Francisco, $47,633.40.

MONTEREY COUNTY—On the San Juan Watsonville Road between junction State Route 56 at Pajaro and 4.9 miles easterly; about 4.9 miles of existing roadway to be graded and surfaced with plant mixed surfacing on untreated rock base. District V, Route 595. Granite Construction Company, Watsonville, $227,384; Edward Keeble, San Jose, $237,155; Clements Construction Company, Centerville, $243,330; L. C. Smith Company, San Mateo, $243,710; Joseph McFadden & Son Inc., Palo Alto, $245,124.80; L. B. Wells Construction Company, Visalia, $246,868; Volpa Bros., Fresno, $260,326; Fredrickson Bros., Emeryville, $265,225.75; McGuire and Hester, Oakland, $273,043.50. Contract awarded to Baun Construction Company, Fresno, $212,862.50.

ORANGE COUNTY—On Huntington Beach Boulevard and Stanton Avenue, between 0.1 mile north of Smeltzer Avenue and 0.1 mile north of Garden Grove Boulevard, about 3.0 miles in length, to be graded and surfaced with plant mixed surfacing on untreated rock base. District VII, Route 171, Section A,B. R. J. Noble Company and R. J. Noble, Orange, $498,863.85; M. S. Mecham & Sons, South Gate, $500,080.30; Matich Brothers, Colton, $501,464.75; Dimmitt & Taylor, Monrovia, $508,342.25; Roland T. Reynolds & Arthur H. Famularo, Anaheim, $509,926.90; Ray F. Hess, Buena Park, $515,913.85; Cox Bros. Construction Company, Stanton, $516,068.20; Sheets Construction Company, Gardena, $516,212; Sully-Miller Contracting Company, Long Beach, $528,887.36; Ralph B. Slaughter, Julian, $585,595. Contract awarded to S. A. Cummings, Compton, $464,492.35.

RIVERSIDE COUNTY—Near the City of Riverside, at the intersection of Eighth Street with Iowa Avenue, traffic signal system and highway lighting to be furnished and installed. District VIII, Route 19, Section B. Drury Electric Company, San Bernardino, $16,753; C. D. Draucker Inc., Los Angeles, $16,987; Fischbach and Moore Incorporated, Los Angeles, $17,358. Contract awarded to Paul R. Gardner, Ontario, $14,203.30.

SAN BERNARDINO COUNTY—For tree removal between Beryle Avenue and Ramona Avenue near Alta Loma. District VIII, Route 190, Section A. Hubbs Equipment Company, Colton, $972; James A. Gorman, Jr., San Bernardino, $3,636. Contract awarded to California Tree Service Inc., Los Angeles, $878.40.

SAN DIEGO COUNTY—Between one mile south and 0.7 mile north of Balboa Avenue, highway lighting systems to be furnished and installed. District XI, Route 2, Section S.D. Chula Vista Electric Company, Chula Vista, $17,860; Ets-Hokin & Galvan, San Diego, $18,894; California Electric Works, San Diego, $20,944; Drury Electric Company, San Bernardino, $30,098. Contract awarded to Pacific Electric, San Diego, $15,883.08.

SANTA BARBARA COUNTY—Between onetenth mile east of Carpinteria Creek and Seventh Street Overcrossing, about 1.4 miles of roadside area to be prepared and planted. District V, Route 2, Section H. Diablo View Garden, Antioch, $14,385; James E. Boothe, Compton, $15,030; K. E. C. Company, Inc., Long Beach, $15,261.79; Stephen L. Vistica, San Mateo, $15,447; Huettig, Schromm and Bennett Inc., Palo Alto, $16,524; Rudolf Watson, San Mateo, $19,242; Castro & Fisher, Glendale, $20,560; Jannoch Nurseries, Altadena, $21,420; Professional Landscaping Service, Redondo Beach, $24,602. Contract awarded to Justice Dunn Company, Oakland, $13,246.

SANTA BARBARA COUNTY—About 1.5 miles north of the City of Lompoc on the Santa Ynez River; steel tetrahedron bank protection to be constructed. District V, Route 56, Section C. Hermreck and Easter, Contractors, Santa Maria, $13,390; R. R. Hensler, Sun Valley, $15,510; Stanley H. Koller Construction, Crockett, $15,682; D. D. Galbraith and Robert E. Batty, Lompoc, $15,778.08; Albert S. Pratt, Jr., Pasadena, $16,630; Charles H. Major, Ojai, $16,792. Contract awarded to Vic Martin, Pasadena, $10,326.

SANTA CRUZ COUNTY—Portions between 6.2 miles east and 8.5 miles east of Watsonville, about 0.8 mile in net length, to be graded and surfaced with plant mixed surfacing on untreated rock base. District IV, Route 67, Section A. Leo F. Piazza Paving Company, San Jose, $124,903.38; Edward Keeble, San Jose, $130,439; Joseph McFadden & Son Inc., Palo Alto, $133,664.07; Fredrickson Bros., Emeryville, $135,931.25; Hermreck & Easter Contractors, Santa Maria, $137,711.25; Close Building Supply Inc., Hayward, $141,037.70; Bickmore-Harper Inc., and Contracting Equipment Rentals Service, Santa Maria, $142,884; McGuire and Hester, Oakland, $143,967.70; George C. Renz Construction Company, Inc., Gilroy, $144,834.10; Transocean Engineering Corporation, Hayward, $147,677.35; S. A. E. Company, Redwood City, $162,221.75. Contract awarded to Granite Construction Company, Watsonville, $123,613.25.

SONOMA, CONTRA COSTA and ALAMEDA COUNTIES—At various locations, asphalt subsealing to be performed. District IV, Route 1, 75,107. W. V. Wright Construction Company, Dallas Texas, $45,660; Vict Martin, Pasadena, $46,650; J. Henry Harris, Berkeley, $49,550; E. S. and N. S. Johnson, Fullerton, $49,650; James M. Pope, Long Beach, $58,000; McGuire & Hester, Oakland, $61,500. Contract awarded to I. J. Ely Company, Larkspur, $45,550.

TEHAMA COUNTY—Trimming trees on State Highway between Los Molinos and Mill Race Creek. District II, Route 3, Section D. Leonards Tree Service, North Sacramento, $3,200; Davey Tree Surgery Company, Ltd., San Francisco, $6,370; Archie Draper, Red Bluff, $16,440. Contract awarded to Joseph M. Oakley Tree Service, Sacramento, $2,684.

VENTURA COUNTY—Between 0.1 mile east of Lord Creek and Route 155 in Fillmore, about 2.4 miles in length, to be graded and surfaced with plant mixed surfacing on selected material, and construct two bridges. District VII, Route 79. Section B. George W. Peterson, and Jack W. Baker, Los Angeles, $742,883.50; Tumblin Company, Bakersfield, $765,261; Clyde W. Wood & Sons, Inc., North Hollywood, $778,596.50; Griffith Company, Los Angeles, $786,850.40; Gordon H. Ball and San Ramon Valley Land Company, Berkeley, $794,061.68; L. A. and R. S. Crow, El Monte, $794,162; Granite Construction Company, Watsonville, $797,328; Basich Brothers Construction Company, R. L. Basich, N. S. Basich and O. B. Peterson, South San Gabriel, $806,817.20; Norman I. Fadel, Inc., North Hollywood, $807,235.60; J. E. Haddock, Ltd., Pasadena, $816,612.45; W. F. Maxwell and Hermreck & Easter, Los Angeles, $817,197.50; J. A. Payton, Riverside, $819,337.10; F. W. Case Corporation and Case Stafford, Inc., Newhall, $831,392.50; Byerts and Sons and George K. Thatcher, Los Angeles, $847,334.25; Webb & White, Los Angeles, $853,104; L. C. Anderson Company, San Diego, $860,637; Sharp and Fellows Contracting Company, Los Angeles, $901,450.90; Matich Brothers and Matich Brothers Paving Company, Colton, $918,926.50. Contract awarded to R. R. Hensler, Sun Valley, $654,413.15.

YOLO COUNTY—On West Sacramento Freeway, between Yolo Causeway and Tower Bridge, highway lighting and illuminated sign systems to be furnished and installed. District III, Route 6, Section C. Sacramento Electric Works, Sacramento, $57,485; Collins Electrical Company, Inc., Stockton, $58,531; R. Goold and Son, Stockton, $60,193; Hall Sloat Electric Company, Inc., Oakland, $62,896; Grason Electric Company, Sacramento, $63,389; Karl F. Stolting, Santa Rosa, $65,200; Underground Electric Construction Company, Oakland, $68,300; Luppen & Hawley Inc., Sacramento, $69,837; Ets-Hokin and Galvan, Oakland, $70,844; Foothill Electric Corporation, Oakland, $71,111; Ed Pierce Electric Company, Inc., Vallejo, $73,552; L. H. Leonardi Electric Construction Company, San Rafael, $77,182; Reliable Elevator Works, Sacramento, $80,129. Contract awarded to Howard Electric Company, Gilroy, $54,981.

BLIND PASSING

It is foolish to pass on a curve, the crest of a hill or any other place where the view of on-coming traffic may be obscured. Yet every year, thousands of motorists try it. A few make it; many do not. Be sure your sight distance is ample and unobstructed before driving around a vehicle ahead of you.

Salinas Freeway

Continued from page 38 . . .

building the structures. The average subsidence at Market Street was about 1.6 feet and about one foot at John Street.

Construction of the third unit from Hartnell Road to Market Street, providing for the remaining grading and paving with portland cement concrete and plant-mixed shoulders and ramps, and reinforced concrete overcrossings at Spence Underpass, Sandborn Road and John Street, was awarded to Gordon H. Ball, San Ramon Valley Land Company and John Delphia of Berkeley. It is anticipated that this contract will be completed early in 1955.

To complete the project between Hartnell Road and Main Street, the fourth unit, construction of the reinforced concrete overcrossing at Bardin Road, will be advertised this summer.

The major items of work on this project consist of 1,300,000 yards of excavation, 36,500,000 station yards of overhaul, 290,000 tons of imported subbase and base material, 38,000 yards of Class "B" portland cement concrete pavement, 12,300 cubic yards of Class "A" concrete structures, 30,000 tons of plant-mixed surfacing.

The total cost of the freeway from Hartnell Road to Main Street will be approximately $5,000,000.

James S. Sturgeon is the Resident Engineer and the Bridge Department representatives are Guy Mancarti and A. F. Hoerchner.

Photographers Find This Section of Highway Alluring

One of many attractive spots on US 101 is the approach to the new Gaviota Tunnel in Santa Barbara County. This photo is looking north toward the tunnel entrance.

GEORGE FARNSWORTH

Continued from page 60 . . .

gon, as well as in California. His first job with the State Division of Highways in California was as assistant resident engineer in 1922 on one of the first construction contracts on the Coast Highway north of Santa Monica through the Malibu Ranch. After handling many large construction projects at various locations throughout the district as resident engineer, George became a member of the district office engineering staff in 1947. Since that time, as demands became more and more pressing he has very successfully organized the functions of his department for greater efficiency and effectiveness.

Now that he has retired, George expects to devote more time to his special hobbies of gardening and photography. Knowing that there might be certain deficiencies in his photographic equipment that he might like to fill, his associates presented him with a check, the proceeds of which he will use for this purpose. He was also presented with an appropriately worded scroll to commemorate his years of service with the State Division of Highways, which was signed by his associates who all sincerely wish for him a full measure of success and happiness in the years to come.

Richmond-San Rafael

Continued from page 33 . . .

The triangular construction towers illustrated in Step 4 are used to set the first 9-foot reinforced concrete cylindrical shell, to brace the remaining shells during construction and to support the tremie pipes during the placing of the concrete inside the shells.

Survey Control Towers

Essential to the work was the fabrication and installation of survey control towers; the rebuilding of a clamshell dredge for deep-water dredging operations; the design and construction of two large floating pile drivers, the Pacific Giant and the Pacific Titan; a floating concrete batching and mixing plant, the Pacific Mixmaster; and the floating derrick, the Pacific Atlas, capable of 160-ton lifts. In addition, the contractor's precasting yard in Petaluma was modified for the heavy precast bell units; the Gilmore yard was developed for splicing H-piles; and arrangements made for the fabrication of the four bell pier steel shell sections at the Basalt Rock Company plant near Napa.

The various methods of constructing the 79 piers for the Richmond-San Rafael Bridge were determined only after a careful study was made of the cost of pier types in relation to span lengths. Some 11 different types were designed and their cost estimated for the 100-foot girder spans, 13 types for the 289-foot spans, and nine types for the large cantilever spans. For the physical conditions existing at the site the bell-bottom pier construction proved, in most cases, much more economical than the other types of piers which were studied.

BUREN THORLEIFSON

Continued from page 58 . . .

Board, transferring to Division of Housing in 1942, and five years later to the Division of Architecture.

Altogether during Thorleifson's years with the Division of Architecture he has been responsible for the supervision of construction in the field in excess of $11,240,000.

Oceanside Freeway

Continued from page 34 . . .

have occurred within the city limits, compared with 210 during the same period last year. This is a 58 percent reduction of auto accidents, Haver pointed out.

Although figures have not been compiled for February, data shows that 32 accidents occurred last November and December compared with 71 and 73 during those months in 1952, while 21 accidents were reported in January of this year compared with 66 during January of 1953.

Engineers of the Division of Highways point out that the marked reduction in accidents since the opening of the freeway is all the more dramatic because the "after" period included the Christmas and New Year holiday weekends when accident hazards are usually increased.

They attribute the marked reduction in the number as well as the severity of accidents throughout the whole City of Oceanside and vicinity area not only to the freeway, which is designed to minimize intersection conflicts, but also to the removal of through traffic from the city streets, leaving the latter less congested.

RICHARD A. TREMPER

Continued from page 56 . . .

in the way of his personal desires and will consent to his transfer to your district."

The district will greatly miss the valuable counsel that the younger members were able to obtain from "Tremp" and will look forward to continued acquaintance with him through the coming year. "Tremp," as he will be remembered by all, will always be missed in the district. It is hoped that he will find complete enjoyment in his retirement and have time to pursue certain beneficial hobbies that he prefers, having recently adopted photography and growing orchids.

ALEXANDER N. LUND

Continued from page 56 . . .

of highway twice more when the restless Merced River went on rampages.

After transferring to Districts I and II and attaining his Associate Highway Engineer's rating, Al finally arrived in District X in September of 1933, where he stayed until retirement, with the exception of a short break of two years spent as Assistant District Construction Engineer in District V.

Al's experience in the Merced and Feather River Canyons earmarked him as a heavy grading expert, so it was only natural that he was given the American Canyon project in Solano County which was the district's most ambitious project up to that time.

In February, 1950, Al won his promotion to Senior Highway Engineer and became District Construction Engineer, which position he held until his retirement.

Serving under four district engineers, R. E. Pierce, P. O. Harding, Chas. E. Waite and J. G. Meyer, District X is dotted with highways constructed under the supervision of Al Lund, their general excellence still bearing testimony to his skill and resourcefulness.

An untiring worker and a matchless instructor, Al will be missed by the entire Construction Department. We all wish him the best of everything in his retirement.

EARL S. WISE

Continued from page 60 . . .

Having considerable interest in the organization for which he worked and also for fraternal organizations, Earl took a very active part in both. During 1941 he served as president of Chapter 10 of the California State Employees' Association. In his fraternal work he served as master of the San Luis Obispo Masonic Blue Lodge and also as High Priest of local Chapter of Royal Arch Masons.

Earl is now looking forward to being at home at 346 Buchon Street in San Luis Obispo and eventually assuming the duties of a grandfather.

GOODWIN J. KNIGHT
Governor of California

FRANK B. DURKEE . . Director of Public Works

CALIFORNIA HIGHWAY COMMISSION

FRANK B. DURKEE, Chairman
H. STEPHEN CHASE . . . . . Sacramento
JAMES A. GUTHRIE . . . . San Bernardino
CHARLES T. LEIGH . . . . . . San Diego
ROBERT E. McCLURE . . . . Santa Monica
F. WALTER SANDELIN . . . . Ukiah
CHESTER H. WARLOW . . . . Fresno
R. C. KENNEDY, Secretary . . . . . Sacramento
RUSSELL S. MUNRO, Deputy Director of Public Works

DIVISION OF HIGHWAYS

GEO. T. McCOY
State Highway Engineer, Chief of Division
R. M. GILLIS . . . . Deputy State Highway Engineer
CHAS. E. WAITE . . Assistant State Highway Engineer
EARL WITHYCOMBE . Assistant State Highway Engineer
F. W. PANHORST . . Assistant State Highway Engineer
J. W. VICKREY . . Assistant State Highway Engineer
R. H. WILSON . . . Assistant State Highway Engineer
F. N. HVEEM . . . Materials and Research Engineer
GEORGE F. HELLESOE . . . . Maintenance Engineer
J. C. YOUNG . . . . Engineer of Design
G. M. WEBB . . . . Traffic Engineer
DON G EVANS . . . . Construction Engineer
H. B. LA FORGE . Engineer of Federal Secondary Roads
C. E. BOVEY . Engineer of City and Cooperative Projects
EARL E. SORENSON . . . . . Equipment Engineer
H. C. McCARTY . . . . Office Engineer
J. C. WOMACK . . . . Planning Engineer
J. P. MURPHY . . . . Principal Highway Engineer
F. M. REYNOLDS . . . . Principal Highway Engineer
E. J. SALDINE . . . . Principal Highway Engineer
A. L. ELLIOTT . . . . Bridge Engineer—Planning
I. O. JAHLSTROM . . . Bridge Engineer—Operations
J. E. McMAHON . . Bridge Engineer—Southern Area
STEWART MITCHELL . Bridge Engineer—Special Studies
E. R. HIGGINS . . . . Comptroller

Right of Way Department

FRANK C. BALFOUR . . . . Chief Right of Way Agent
E. F. WAGNER . . . Deputy Chief Right of Way Agent
GEORGE S. PINGRY . . . . Assistant Chief
R. S. J. PIANEZZI . . . . Assistant Chief
E. M. MacDONALD . . . . Assistant Chief

District IV

B. W. BOOKER . . . Assistant State Highway Engineer

District VII

P. O. HARDING . . Assistant State Highway Engineer

District Engineers

ALAN S. HART . . . . District I, Eureka
J. W. TRASK . . . . District II, Redding
A. M. NASH . . . . District III, Marysville
J. P. SINCLAIR . . . . . . District IV, San Francisco
L. A. WEYMOUTH . . . . District IV, San Francisco
E. J. L. PETERSON . . . District V, San Luis Obispo
E. T. SCOTT . . . . District VI, Fresno
W. L. FAHEY . . . . . District VII, Los Angeles
E. T. TELFORD . . . . . District VII, Los Angeles
C. V. KANE . . . . . District VIII, San Bernardino
MILTON HARRIS . . . . . . District IX, Bishop
JOHN G. MEYER . . . . . . District X, Stockton
E. E. WALLACE . . . . . District XI, San Diego
HOWARD C. WOOD . . . . Bridge Engineer
State-owned Toll Bridges

DIVISION OF CONTRACTS AND RIGHTS OF WAY

Legal

ROBERT E. REED . . . . . Chief Counsel
GEORGE C. HADLEY . . . . Assistant Chief
HOLLOWAY JONES . . . . Attorney

DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

NORMAN C. RAAB . . . . . . Chief of Division

DIVISION OF WATER RESOURCES

A. D. EDMONSTON
State Engineer, Chief of Division
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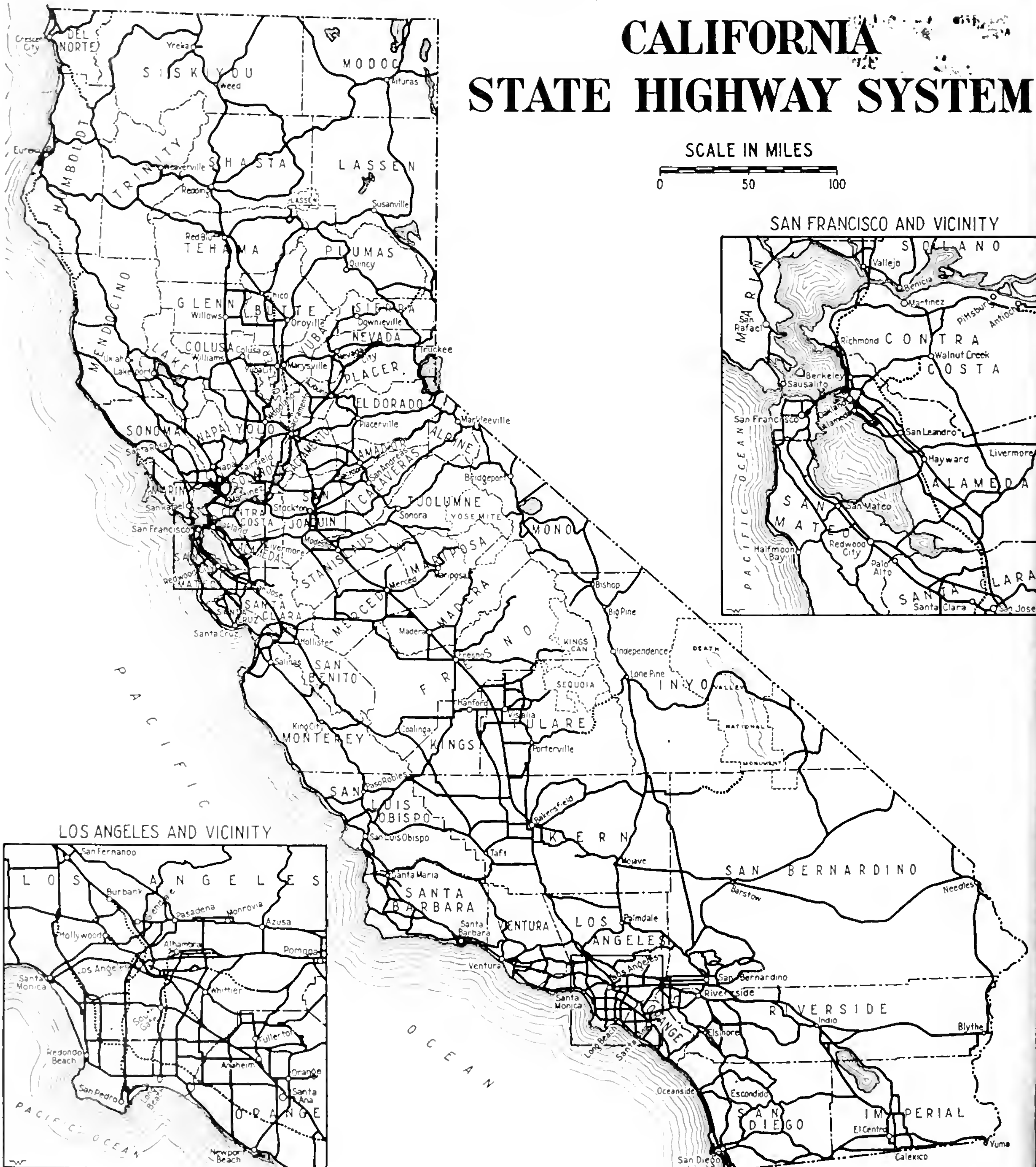

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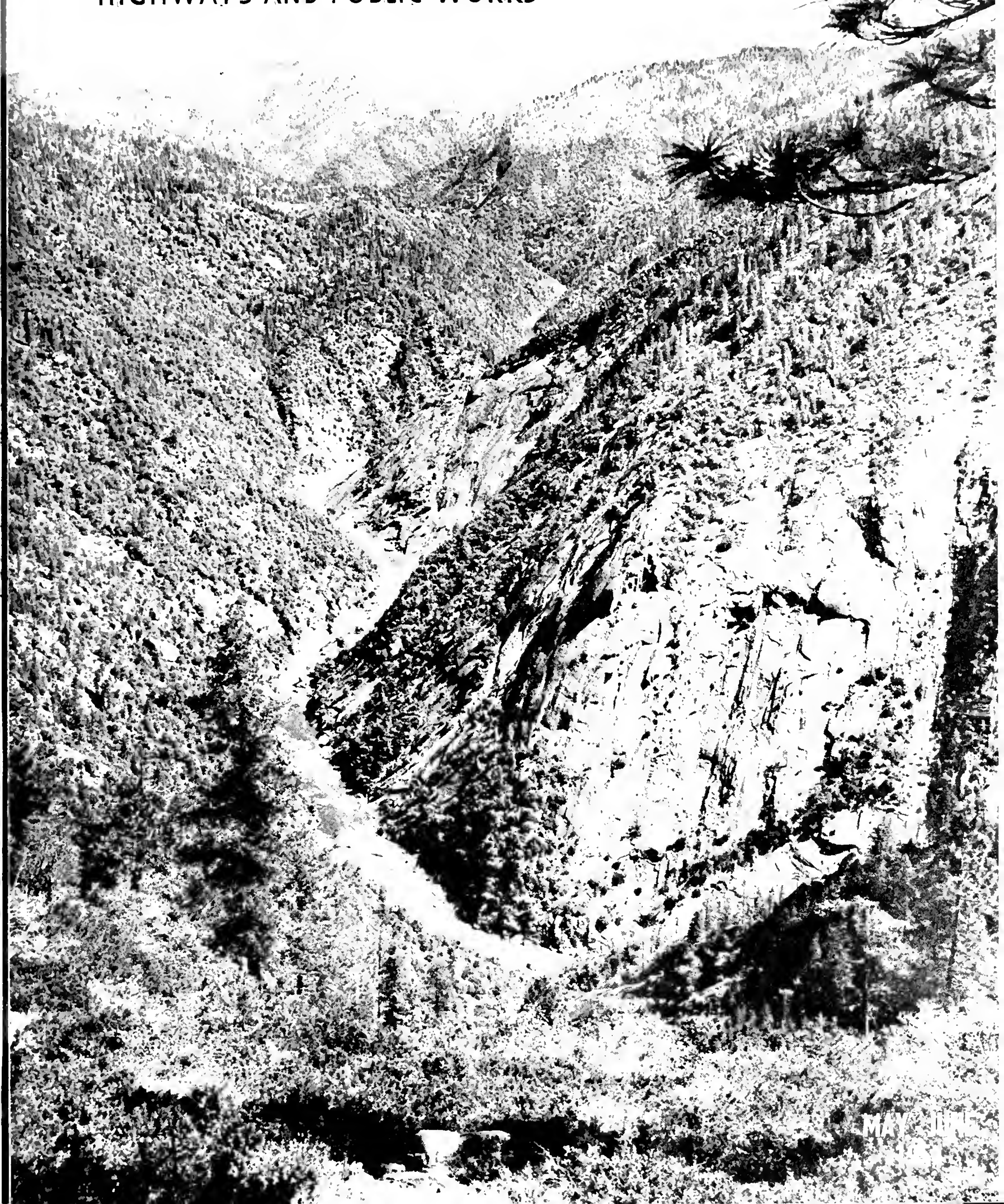

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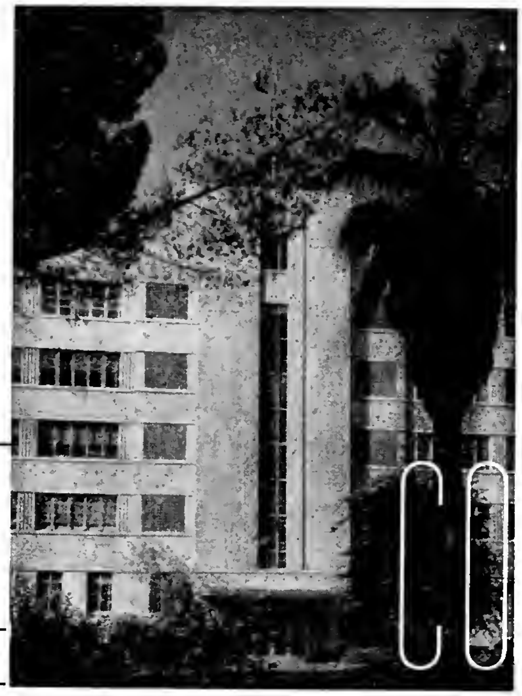

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Sacramento, California

Rapid Progress on Harbor Freeway

By W. L. FAHEY
District Engineer, District VII

Multimillion-dollar Project Reviewed

SINCE the last issue of *California Highways and Public Works* went to press, two construction events have occurred on the Harbor Freeway that are of considerable importance to the traveling public in the Los Angeles metropolitan area. On March 23, 1954, the J. E. Haddock, Ltd., construction contract for grading and paving the Harbor Freeway from Third Street to Olympic Boulevard was completed and opened to traffic. On May 14, 1954, the northerly half of the Oberg Bros. contract was completed and opened to public traffic from Olympic Boulevard to Washington Boulevard. Public traffic utilizing the Harbor Freeway now has the full use of the 2.2 miles of completed freeway southerly from the four-level structure.

Under the Oberg Bros. contract, construction is now in progress from Washington Boulevard southerly to Flower Street near the intersection with 23d Street. This construction is anticipated to be completed in November, 1954. Also under construction is the new J. E. Haddock, Ltd., contract between 23d Street and 42d Street, 1.4 miles, scheduled for completion in November, 1955. This contract includes not only the grading and paving for an eight-lane freeway, but also the construction of grade separation bridges at Flower Street, Adams Boulevard, 28th Street, 29th Street, 30th Street, Jefferson Boulevard, Exposition Boulevard, 37th Street, 39th Street and Santa Barbara Avenue.

One of Largest Contracts

This is one of the largest freeway contracts that has been awarded in District VII, having a total contract allotment of \$3,325,584.05. On this contract bids were opened on March 25, 1954, and the contract was approved on April 20th. Notwithstanding this, the contractor, being anxious to get off to a good start, actually started his construction operations on April 12th. The first item of work which the contractor has undertaken is to construct the detour for Flower Street traffic around the site for the overcrossing bridge to carry Flower Street over the freeway. This flying start which the contractor has obtained should assure completion of this section of the Harbor Freeway on schedule, or ahead of schedule.

W. L. FAHEY

Additional construction activity can be expected within 30 days on the south end of the Harbor Freeway between Battery Street and 0.2 mile north of Pacific Coast Highway (State Highway Route 60), with the announcement that bids will be received in the District VII office of the State Division of Highways at 120 South Spring Street in Los Angeles on June 10, 1954. This section of freeway is 2.8 miles in length and is to be financed from an item of \$4,650,000 in the 1954-55 Fiscal Year budget. This construction calls for a number of grade separation bridges at intersecting streets and railroads. The bridge structures and the grading are for a six-lane freeway.

Six-lane Freeway

Designs on the Harbor Freeway are on the basis of providing a six-lane freeway from the southerly terminus at Battery Street to the future Sepulveda Freeway interchange near 190th Street. From 190th Street northerly the design provides for an eight-lane freeway to the northerly terminus at the four-level traffic interchange structure.

Freeway construction through developed metropolitan areas, as is the case with the Harbor Freeway, requires a considerable amount of reconstruction on the part of existing public utility companies. The State has had excellent cooperation from the Pacific Telephone and Telegraph Company, the Los Angeles City Department of Water and Power, the various railroad lines, and other utility companies.

In the case of the Pacific Telephone and Telegraph Company, many toll cables and trunk lines have had to be moved and reconstructed to clear freeway construction. In some cases double moving is necessary; first, with installation on detours, and later on, within the permanent construction. The Los Angeles City Department of Water and Power has been required to move large water mains and underground and overhead power lines. The Pacific Electric Railway did considerable adjusting of its high power trans-

Looking southwesterly showing Harbor Freeway location close to Flower Street and Figueroa Street. Cleared right of way is in evidence foreground and center left. Los Angeles Memorial Coliseum in Exposition Park is shown center right.

mission lines at the Second Street Undercrossing with the Harbor Freeway.

Public Utilities Problem

An excellent example of the reconstruction required of public utilities located in a city street crossing the Harbor Freeway may be had by examining the situation at the Seventh Street Overcrossing Bridge. During the construction of this bridge it was necessary to carry the heavy Seventh Street traffic over a temporary detour in order that the bridge might be constructed in the old street area. It was necessary to relocate temporarily all public utilities in the detour area. This included the Los Angeles Transit Lines' trolley system and tracks, the Pacific Telephone and Telegraph Company's conduit and cables, City of Los Angeles Water Department's 30-inch water main, City of Los Angeles Power Department's distribution system, and Western Union Telegraph Company's conduit and cable. All of these moves were accomplished prior to the beginning of construction, with the exception of the Los Angeles Transit Lines, which move had to be accomplished during the construction of the detour in order to keep traffic moving at a normal rate on Seventh Street.

In order for the Pacific Telephone & Telegraph Company to plan and accomplish its temporary relocation, it was necessary to serve it with legal notification to move 18 months prior to the beginning of actual construction of the bridge. During construction of the bridge and just prior to the deck construction, all utilities, with the exception of the Los Angeles Transit Lines, installed their new facilities in the new bridge structure. The cost to the State for the relocation of various utilities at this one crossing of the freeway was approximately $200,-000.

Cost of Utility Relocation

The relative cost of the relocation of public utilities made necessary by freeway construction decreases per mile as the construction moves outward from the central business area of the city. Between the four-level structure and Olympic Boulevard the cost per mile to the State for utility relocation was approximately $313,-000. For the next three miles the average cost per mile is approximately $160,000. The total cost to the State of the relocation of all public utilities along the Harbor Freeway from the four-level structure south to Battery Street, a distance of 22.8 miles, is estimated to be $2,300,000.

Adjustments have been necessary to existing railroad facilities in the case of the Atchison, Topeka and Santa Fe Railroad and the Pacific Electric Railway in order to work out grade separations with the freeway. Negotiations between State and utility companies have been made well in advance of construction, and, due to the wholehearted cooperation had from the utilities, no serious delays have been occasioned in freeway development.

Freeway 22 Miles Long

The Harbor Freeway, considered as a whole, is 22.8 miles in length extending from Battery Street in the San Pedro area to the four-level traffic interchange structure near the Los Angeles Civic Center. The Harbor Freeway comes in on the second level of this structure and becomes the Arroyo Seco Freeway extending northerly to Pasadena. The fourth, or top, level of this traffic interchange system carries the Hollywood Freeway, and the first and third levels carry interchange roadways. The design of the four-level traffic interchange structure that cost $1,500,000 was worked out as the most practical and least costly solution to the very complicated traffic interchange problem that was recognized to exist at this location. The State Division of Highways initiated the design and carried out the construction of this four-level grade separation structure that is the first of its kind to be built anywhere. This system provides for traffic flow in all

Evening peak hour traffic on the Harbor Freeway, with the Fifth Street Overcrossing in the foreground, the Fifth Street southbound on-ramp in the center and the northbound on-ramp carrying traffic in the direction of the four-level structure

Looking southerly along routing of Harbor Freeway with Los Angeles Harbor and Pacific Ocean in background. Los Angeles County Sanitation Plant appears center right inside loop of freeway location.

directions so that motorists can change from one freeway to another with little inconvenience and loss of time.

Freeway Location

From the four-level structure the Harbor Freeway location skirts along the westerly edge of the Los Angeles business area in rather close proximity to Figueroa Street, existing State Highway Route 165, that the Harbor Freeway will eventually replace as a state highway route. The freeway location crosses from the west side of Figueroa Street to the east side of this traffic artery at 23d Street. At this location a very complicated bridge structure passes the Harbor Freeway under Figueroa Street and 23d Street. Southerly the freeway location passes under Flower Street and West Adams Boulevard and also under 28th, 29th and 30th Streets. The freeway location passes over Jefferson Boulevard a short distance easterly of Flower Street providing ample clearance with Los Angeles Exposition Park and the Olympic Coliseum. The freeway location lies approximately halfway between Figueroa Street and Broadway from Santa Barbara Avenue southerly to 124th Street where the freeway then swings westerly of Figueroa Street and extends southerly approximately equidistant between Figueroa Street and Vermont Avenue.

Intersects Sepulveda

The Harbor Freeway location intersects the future Sepulveda Freeway location close to 190th Street where a special traffic interchange facility is now in process of design. The location from this intersection with the Sepulveda Freeway southerly has been very carefully worked out to keep interference with oil wells and oil refinery operations to a minimum. Approaching the harbor area the freeway location, still lying westerly of Figueroa Street and westerly of Wilmington-San Pedro Road, skirts to the east of the Union Oil Refinery. The southerly terminus of the freeway is at Battery Street and Gaffey Street in the San Pedro area near the west basin of Los Angeles harbor.

The pressing need for a new highway arterial between Los Angeles central business district and Los Angeles Harbor, to supplement the existing congested city streets and county roads, was quite generally recognized even some 15 years ago. It is indeed difficult to give credit where credit is due for the inception of the freeway idea and development of the Harbor Freeway. To list by name, all of the civic-minded individuals who have had an important part in the development of the Harbor Freeway, would be an impossible task because so many of the important contributions of some individuals would be certain to go unnoted. The same can likewise be said of any attempt to mention all of the various organizations which had an important part in developing the Harbor Freeway.

Early Reports

Turning to the early reports that were first published that served to focus public attention on the great traffic need for the Harbor Freeway was the publication by the Engineering Department of the Automobile Club of Southern California, dated April 16, 1937, entitled, "Traffic Survey Los Angeles Metropolitan Area." In this report a routing is shown for a new "motorway" between downtown Los Angeles and the harbor area that roughly approximates the routing now adopted for the Harbor Freeway. Later under date of December 7, 1939, a more comprehensive report was made by the City of Los Angeles Transportation Engineering Board, the Citizens Transportation Survey Committee, and the U. S. Works Progress Administration, in which a proposed new highway arterial between the Los Angeles downtown area and Los Angeles Harbor was treated in three sections and called, "West Bypass," "Inglewood Parkway," and "Harbor Parkway." The combination of these three sections of proposed highway arterials in general follow quite closely to the Harbor Freeway as later adopted by the State Highway Commission and now under construction. In this report credit is given to other cooperating agencies as follows: Los Angeles Traffic Association, Central Business District Association, Los Angeles County Regional Planning Commission, and the Automobile Club of Southern California.

The Regional Planning Commission of Los Angeles County has played an important part in the development of the freeways in this area. A freeway location between the Los Angeles central business district and the harbor area is noted in the Regional Planning Commission's publication dated 1943, entitled, "Freeways for the Region." The County Planning Commission, through its control of subdivisions, has been instrumental in protecting future freeway routes from encroachment by proposed subdivisions and by housing projects that would otherwise have greatly increased the later cost of right-of-way acquisition.

Looking northerly along Harbor Freeway route, showing Los Angeles downtown area background right, Los Angeles County Sanitation Plant shown center left

Cooperating Agencies

Another important publication which gave further support to the Harbor Freeway development was the report by the Los Angeles Metropolitan Parkway Engineering Committee dated March 30, 1946, entitled, "Interregional, Regional, Metropolitan Parkways." This report gave valuable information to the *Joint Fact-Finding Committee on Highways, Streets and Bridges of the California Legislature.* This report listed as cooperating agencies the following: County of Los Angeles, Cities of Los Angeles County, Automobile Club of Southern California, Los Angeles Traffic Association, California State Chamber of Commerce, Los Angeles Chamber of Commerce, Central Business District Association, and the Downtown Business Men's Association.

The recommendations in this report and the facts and statistics printed therein were of great value to the California Legislature in its deliberations prior to the adoption of the Collier-Burns Highway Act of 1947, the passage of which greatly increased state highway funds available for freeway construction.

The bridges on the Harbor Freeway have been and are being designed by the Bridge Department of the State Division of Highways. The roadway plans for the freeway are developed in the District VII office in Los Angeles.

Locating Surveys

In making the location surveys for the Harbor Freeway, various methods were followed. Throughout the project all the available maps and existing survey information on intersecting and nearby city streets and county roads were obtained. The centerline survey was tied into the California

Aerial view of Harbor Freeway, looking northerly from Ninth Street, as it passes Statler Hotel, center right

Grid System that is in general use by Los Angeles County, Los Angeles City and other agencies. Direct location methods were followed in carrying out surveys for the major portions of the project but in the case of the eight-mile length through the Gardena area, advantage was taken of aerial survey maps in determining and computing alignment. The aerial survey mosaic maps were on a scale of 1 inch to 50 feet.

In the development of the portion of the plans for the Harbor Freeway within the City of Los Angeles areas the State has the cooperation of the Los Angeles City Bureau of Engineering. Detailed plans are developed by the Los Angeles City Bureau of Engineering for reconstruction of those existing facilities on city streets such as sanitary sewers, storm drains, lighting systems, and traffic signal installations where changes are made necessary by reason of freeway construction. In the establishment of a freeway through developed portions of a city the interference with existing facilities that is necessitated by the freeway construction is much more widespread than is generally realized. Sometimes reconstruction of sanitary sewers and storm drains has to be carried out many blocks distant from the freeway because of changes made necessary in the grade lines, particularly when the freeway is depressed below the ground surface.

For portions of the Harbor Freeway in county areas the State Division of Highways had the benefit of cooperation from the Los Angeles County Road Department and the Los Angeles County Storm Drain Department. Without the wholehearted cooperation of these other governmental agencies the progress of construction on the Harbor Freeway would not be so far along as it is today.

Design of Freeway

In the design of the Harbor Freeway, its extensive utilization by mass transportation busses is anticipated and is being provided for. The freeway will have bus turnout roadways at Seventh Street, between Pico Boulevard and Venice Boulevard, at Jefferson Boulevard and at Santa Barbara Avenue. Full provisions will be made at these locations for passenger loading and unloading facilities and stairways so that passengers can transfer between the busses operating on freeways and those operating on existing surface streets.

It has been ruled that state highway funds cannot legally be used for right-of-way acquisition and construction to provide bus transfer facilities. The City of Los Angeles has agreed to contribute sufficient city funds to reimburse the State for the construction of bus passenger loading and unloading facilities on the Harbor Freeway.

Planning and design work on the freeway started about 12 years ago when plans were being developed for the four-level traffic interchange structure at the northerly terminus of this freeway. The last freeway agreement contract with Los Angeles City and Los Angeles County was executed on August 11, 1950. Since then engineers in the drafting room crews of District VII have worked steadily on plans for the entire 22.8 miles of the freeway so that a schedule of contract advertising could be worked out that would utilize construction funds as they were budgeted by the State Highway Commission.

Economical Routing

The determination of the most economical routing for the Harbor Freeway through built-up and highly developed sections of Los Angeles City has presented many problems.

In some cases the selection of the alignment made necessary the demolition of churches and schools. In other cases, the alignment was adjusted to miss large costly installations such as the Nurses Home of the Methodist Hospital where extensive retaining wall construction was necessary. Even with all the adjustments it was possible to make in the location of the Harbor Freeway, the removal of many costly structures was necessary. Three churches in the path of the freeway have had to be demolished since they were too large to be moved economically by the usual housemoving methods. To clear the Orthopaedic Hospital on the east side of Flower Street it was necessary to shift the Flower Street-Adams Boulevard intersection to the west in order to eliminate a city street intersection occurring on the bridges for these two streets. This shift created an unusual condition in which, for economy of cost, the Adams Boulevard west abutment and Flower Street south abutment are joined together. At this location, in order to carry the heavy traffic on each street, it was necessary to work out a system of detours that would inconvenience public traffic as little as possible.

Throughout the entire length of project every effort has been made to locate the alignment and design the various sytems for traffic interchanges at important cross arteries to keep construction costs and right-of-way costs to a minimum. Wherever possible, damage to expensive installations has been avoided. The design has been carefully worked out passing through oil field areas so that construction would clear highly productive oil wells.

Looking southerly along route of Harbor Freeway, showing Los Angeles Harbor in background, left, and Palos Verdes Hills background, right. The curving location of the Harbor Freeway that was necessary in order to miss highly productive oil wells is shown.

Design Problems

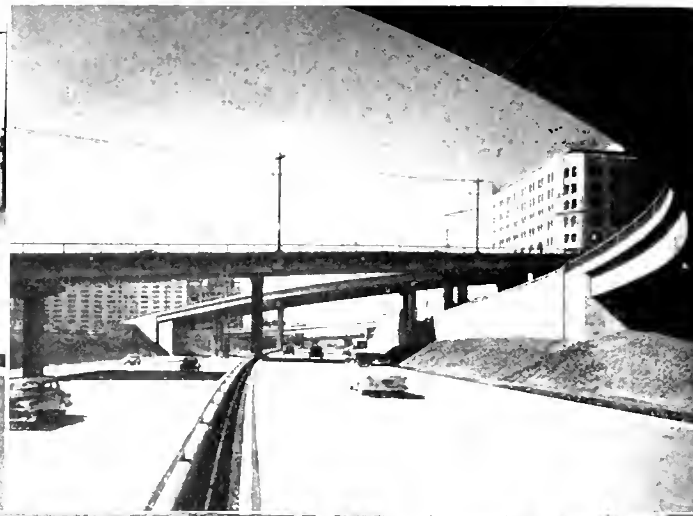
Design problems were also presented where the freeway had to be located in close proximity to very expensive oil refineries. In the case of the Shell Oil Refinery between Del Amo Boulevard and 190th Street the location chosen clears this plant in its entirety. At the southerly end of this project, between Anaheim Street and Battery Street, the location skirts around the easterly edge of the Union Oil Company Refinery and the Western Oil Terminal Company. The design of the freeway at this location has been worked out to keep interference with these oil refinery installations to a minimum. The reconstruction of these oil refinery facilities consists of relocation of pipelines leading to the loading docks in the west basin of Los Angeles Harbor and alterations to some buildings in the distribution plant.

The Harbor Freeway makes intersection with three other freeways: the Hollywood Freeway at the north end which is now completed and in operation, the Olympic Freeway for which designs are about to be started, the Sepulveda Freeway for which designs are now in process, working toward right-of-way acquisition negotiations in this area.

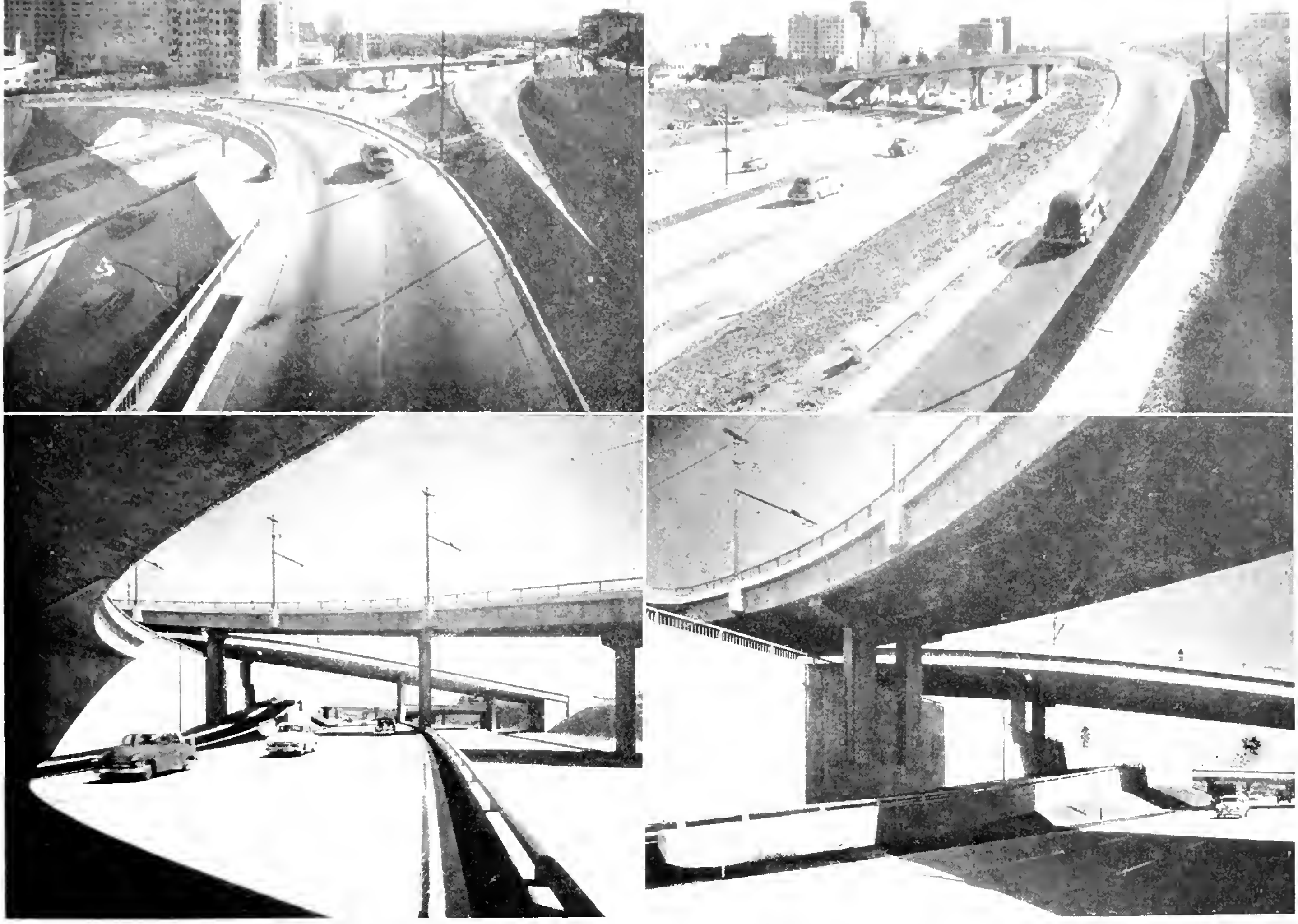
A railroad grade separation structure is now under construction for the Southern Pacific Railroad branch line on Exposition Boulevard. Designs are now in progress for the railroad grade separation structure needed for the Atchison, Topeka and Santa Fe Railway on Slauson Avenue. Preliminary studies are under way for the railroad grade separation structure required on the Pacific Electric Railway line just southerly of Imperial Highway and

Looking northwesterly. Santa Monica mountains in background, showing Harbor Freeway in close proximity to Figueroa Street. The United States Government refinery leased to the Shell Oil Company is shown center left.

Looking northerly along route of Harbor Freeway showing Los Angeles downtown area, background, right. This portion of alignment was carefully located to clear oil production facilities.



UPPER LEFT Looking east on Slauson Avenue in vicinity of future route of Harbor Freeway. UPPER RIGHT Looking southerly from under on-ramp bridge for southbound traffic from Fifth Street. CENTER Looking southerly with Statler Hotel in background. LOWER—Looking south along freeway, showing heavy northbound traffic passing under Fourth Street overcrossing.



UPPER LEFT—Looking southerly, showing off-ramp to Sixth Street. UPPER RIGHT—Looking southerly, showing Fourth Street bridges in center; Jonathon Club building, center, background. LOWER LEFT—Looking northerly from under off-ramp to Sixth Street. LOWER RIGHT—Looking northerly, showing structural details of Sixth Street Underpass.

for the Pacific Electric Railway tracks at 149th Street south of Rosecrans Avenue. Preliminary studies are also under way for the Atchison, Topeka and Santa Fe branch line southerly of the Sepulveda Freeway.

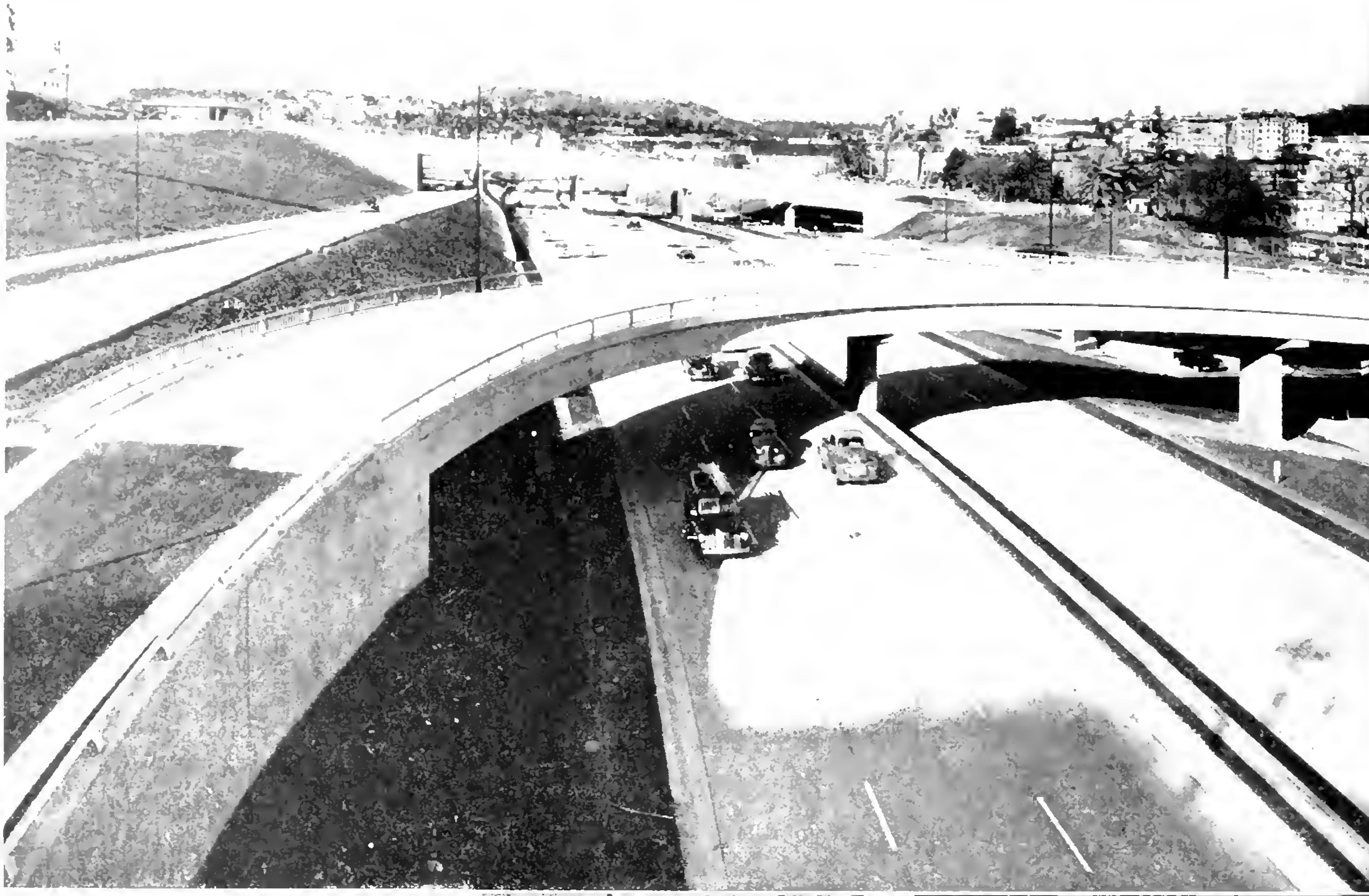
Is Full Freeway

The designing of the Harbor Freeway throughout its entire length is on the basis of an eight-lane freeway from the four-level traffic interchange structure to the future location of Sepulveda Freeway near 190th Street. From the Sepulveda Freeway southerly to Battery Street in the harbor district the freeway is designed for six lanes although the initial construction on this southerly end will be for a four-lane freeway. Throughout the entire length the freeway is a full freeway in every respect with no intersections at grade and all rights of ingress and egress for abutting property taken.

Bridge structures play a very vital role in the development of the Harbor Freeway. In some locations the expenditures for bridge structures on a per mile basis equals or even exceeds the expenditures for the road facilities, sometimes costing in excess of $2,000,000 per mile. The bridges thus far designed and constructed are of the reinforced box girder type. Foundation conditions have been thoroughly investigated in advance for each structure by foundation drilling. Test holes at the bridge site are drilled as much as 80 feet to 100 feet in depth. On the basis of subsurface investigations the footing designs are worked out with bridge structures supported on steel-H piling and cast-in-place concrete piling, using both driven steel shells and drilled holes without steel shells. In many cases reinforced concrete spread footings without piles are satisfactory when foundation conditions are found to be good.

Many Bridge Structures

Many bridge structures on the Harbor Freeway have been constructed

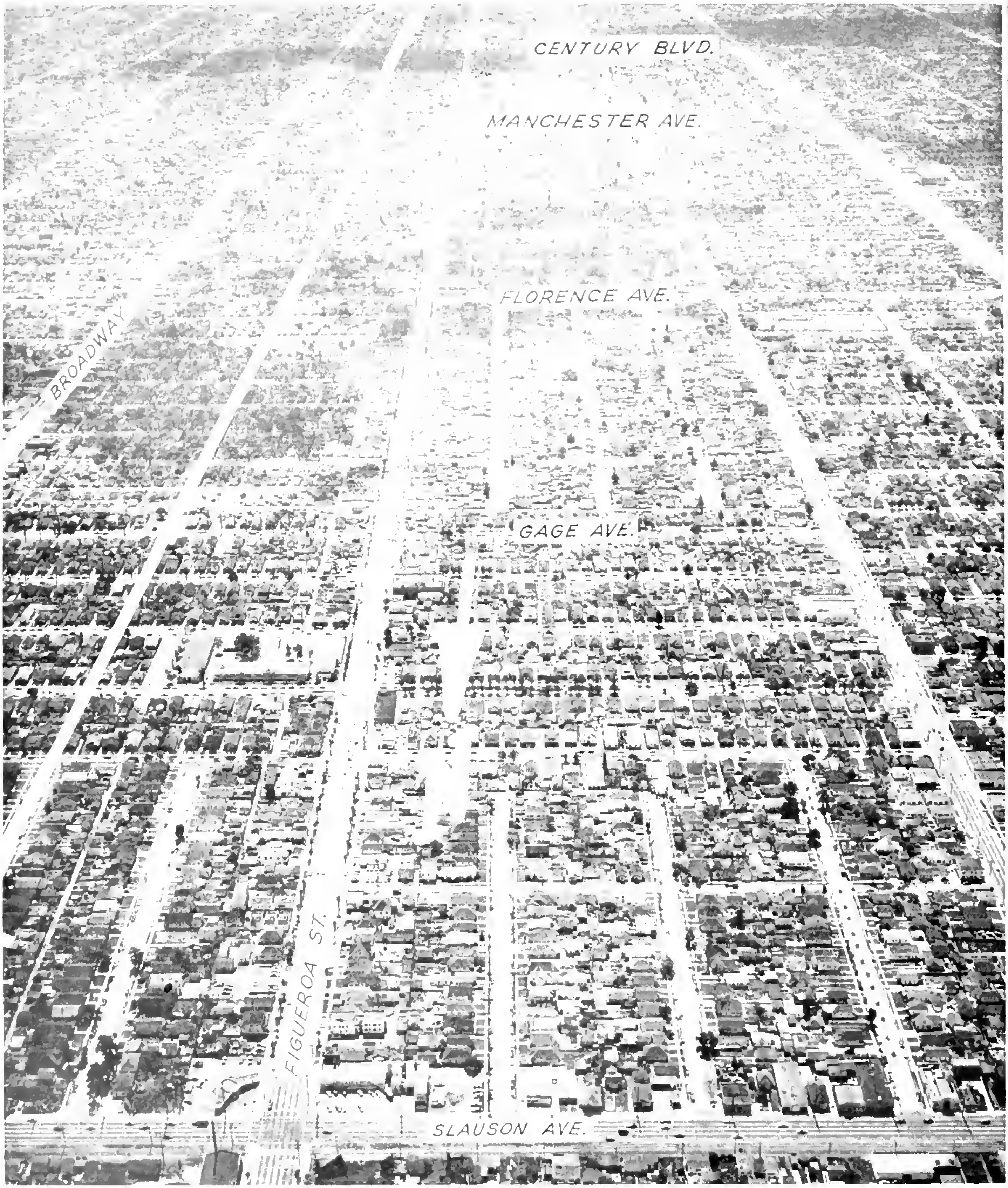


UPPER Looking northerly, showing in foreground ramp bridge for southbound traffic from Fifth Street. LOWER Looking westerly, showing construction details of Sixth Street Bridge.

under separate contracts well in advance of the road work. All bridge structures between the four-level traffic interchange structure to the north and Olympic Boulevard to the south were constructed under separate contracts in advance of the road construction contracts. On the other sections, road and bridge construction will be included in the same contracts. All bridge structures are designed for American Association of State Highway Officials standard loading H-20-S-16, meaning a 20-ton truck followed by a 16-ton trailer.

Satisfactory progress has been and is being made in the acquisition of rights of way for the freeway. To date over 2,000 parcels have been acquired at a total cost of about $38,-000,000. It is interesting to note that of this large number of parcels sub-

Looking northerly along Main Street with Los Angeles downtown area, background, right. Location of Harbor Freeway is in close proximity to Figueroa Street in center left.



Looking southerly along freeway, showing location half way between Broadway and Figueroa Street

Looking south along Harbor Freeway. Wilshire Boulevard Overcrossing in foreground; Seventh Street Overcrossing in center.

stantially all have been acquired by negotiation. The State has gone to court in condemnation trial proceedings for the determination of the money to be paid owners for their property in only 64 instances. The fact that it has been necessary to institute right of eminent domain proceedings in the case of only 3 percent of parcels being acquired is a good indication that the prices paid by the State to property owners for land and improvements taken are fair and equitable.

Cost of Right of Way

In acquiring and clearing right of way through the downtown business area in Los Angeles between First Street and Olympic Boulevard, some very large buildings housing businesses and multiple-unit apartments have had to be demolished. The cost of right-of-way acquisition in this area totaled $11,000,000. This is the most expensive right-of-way acquisition yet encountered on any of the Los Angeles freeways. One operation of right-of-way clearing that attracted considerable

. . . Continued on page 32

CONSTRUCTION CONTRACTS—HARBOR FREEWAY

Description	Awarded	Completed	Cost	Contractors	Resident engineers
Temple St.—undercrossing	10-14-47	12-28-48	$381,000	James I. Barnes Cons. Co., Santa Monica	W. A. McIntyre
1st and 2d Sts.—undercrossing	11-10-49	1 18-51	444,600	Oberg Bros. Constr. Co., Inglewood	C. T. Woodbridge
3d St.—two R. C. overcrossings	6-10-50	8-13-51	378,900	Chas. MacClosky Co., Los Angeles	C. T. Woodbridge
4th St.—overcrossing and grading and paving	8-17-50	3-25-52	567,900	W. J. Disteli, Los Angeles	Carl Verner
5th and 6th Sts.—five overcrossings and two pedestrian undercrossings	12- 8-50	3-11-53	1,041,900	Winston Bros. Co., Los Angeles	W. Harold Johnson
Wilshire Blvd.—overcrossing	3-27-51	11- 6-52	376,400	Webb & White, Los Angeles	Wilfred E. Bastues
4th to Temple—freeway and pedestrian underpass	6-14-51	7-30-52	706,700	Webb & White, Los Angeles	H. E. Belford
3d to Temple—lighting and signs	6-14-51	7- 9-52	42,300	Ets-Hokin & Galvin, San Francisco	Ray E. DeGroff
7th, 8th and 9th Sts.—six bridges, overcrossings and undercrossings	10-19-51	8-21-63	1,241,300	Oberg Bros. Constr. Co., Inglewood	L. E. Crayne
Olympic Blvd.—R. C. bridge undercrossing	5-20-52	7-17-53	350,000	Oberg Bros. Constr. Co., Inglewood	Clinton Tompkins
11th and 12th Sts.—R. C. bridges, undercrossings	7- 2-52	6-17-53	374,000	Oberg Bros. Constr. Co., Inglewood	Wilfred E. Bastues
Pico Blvd. and Venice Blvd.—undercrossings	8-27-52	10-26-52	487,000	Oberg Bros. Constr. Co., Inglewood	F. M. Morrill
2d to Olympic—freeway retaining walls and pedestrian underpass	9-24-52	3-23-54	2,058,900	J. E. Haddock, Pasadena	H. E. Belford
2d to 11th—lighting and signs	12-15 52	3-23-54	128,200	C. D. Drauker, Inc., Los Angeles	Ray E. DeGroff
Olympic to Flower—freeway, two overcrossings and one undercrossing	6-25-53	Est. 10-30-54	1,796,400	Oberg Bros. Constr. Co., Inglewood	H. E. Belford
21st to Jefferson St.—sewers and storm drains	7- 8-53	2-25-54	330,300	Oberg Bros. Constr. Co., Inglewood	C. L. Aisthorpe
Olympic to Flower—lighting and signs	10-20-53	Est. 2-28-55	84,800	Westates Elec. Constr. Co., Los Angles	Ray E. DeGroff
23d to 42d St.—freeway and bridges	4- 1-54	Est. 11-25-55	3,325,600	J. E. Haddock, Ltd., Pasadena	H. E. Belford, Homer J. Scott
			$14,116,200		

Quake Fault

Historic Fort Ross Cut Off by Coast Highway Slide

By R. D. KINSEY, Assistant District Engineer

A SLIDE on the Coast Highway, Sign Route 1, between the communities of Jenner-by-the-Sea and Fort Ross in Sonoma County, closed the highway to travel on April 11, 1954.

The slide is located on the Mary A. C. Charles ranch approximately eight miles north of Jenner and approximately four miles south of Fort Ross and developed within the body of an old slide that originally moved, according to Mrs. Charles, at the time of the 1906 earthquake. The upper reaches of the slide are approximately 450 feet above the highway.

The closing of the highway by this slide has seriously inconvenienced highway travel in this location due to a lack of parallel roads. The California Highway Commission, recognizing the local importance of this section of state highway, has allocated $100,000 per year since 1950 to correct the many substandard sections of the highway.

It has been possible to detour light traffic and single truck traffic around the slide area over county roads, with some increase in over-all distance. Upon the closing of the highway the Pacific Greyhound canceled its bus route between San Francisco and Fort Bragg by way of the Coast Highway.

The lack of availability of detour for the heavy trucks and trailers utilized by the lumbering industries for hauling their mill products from the number of mills in the vicinity of Gualala, Plantation and Fort Ross placed an additional burden on the mills due to their inability to store their products for lack of space. For this reason it is necessary to provide a means for this traffic past the slide area and a schedule was developed with the operators by which an opening would be made during the dark period of the day.

Immediately upon indication that resloping of the slide area was required tractor and bulldozer equipment started operations sloping the area and are progressing utilizing all daylight hours in order to have this highway, which is of important local use, reopened to traffic as early as possible.

After the slide operations were in progress and the area had been benched approximately 150 feet below the top, additional movement occurred southerly of the operations at the time of the recent earthquake at Watsonville. This is a natural development in view of the fact that this slide area is located on the active San Andreas earthquake fault with the result that it was necessary to remove the equipment back to the approximate starting elevation and widen the area to be sloped. This width of sloping is approximately 200 feet above the roadway where the work will be reduced in scope and continuing a width of approximately 100 feet to the roadway.

The pictures accompanying this article illustrate the broken terrain found throughout the length of the San Andreas fault where many slides have occurred in the past and can be expected to repeat in the future.

Graphic aeriol photo showing extent of slide which closed Sign Route 1 between Jenner and Fort Ross

UPPER—Aerial photo showing Fort Ross on left and Coast Highway leading to Jenner on right
LOWER—This picture shows rugged terrain between Jenner and Fort Ross

Hollywood Freeway

By R. C. KENNEDY, Secretary, California Highway Commission

Thursday, April 15th, the last link of the Hollywood Freeway was officially opened. The last section of this world famous freeway is between Hollywood Boulevard and Mulholland Bridge in Los Angeles County.

Traditional ribbon-cutting ceremonies were held on the inbound lanes half way between Mulholland Bridge and Pilgrimage Bridge at 9.30 a.m. under the sponsorship of the Hollywood Chamber of Commerce with John B. Kingsley as general chairman. Kingsley obtained the attendance of Bob Hope to act as master of ceremonies for the occasion.

After Kingsley had introduced local celebrities he called on Assistant State Highway Engineer Paul O. Harding to introduce the engineers and contractors who had worked on the job, after which Frank B. Durkee, Director of Public Works and Chairman of the Highway Commission, was called on. His remarks were short, but to the point, regarding the completion of this job and the trials and tribulations of building freeways.

And then Kingsley called on Bob Hope to act as master of ceremonies for the balance of the program. Naturally, the quips and jokes fell fast and often. One thing that Hope mentioned was that now the freeway was completed he was going to miss the detours as Seattle was so nice at that time of the year.

Then came the ribbon cutting. Helped by Durkee and Kingsley, the strip of movie film was cut by Hope and the official caravan drove over the new freeway. Thousands of motorists had lined up behind the barricades in order to be among the first over the new road. They followed the official caravan and continued downtown.

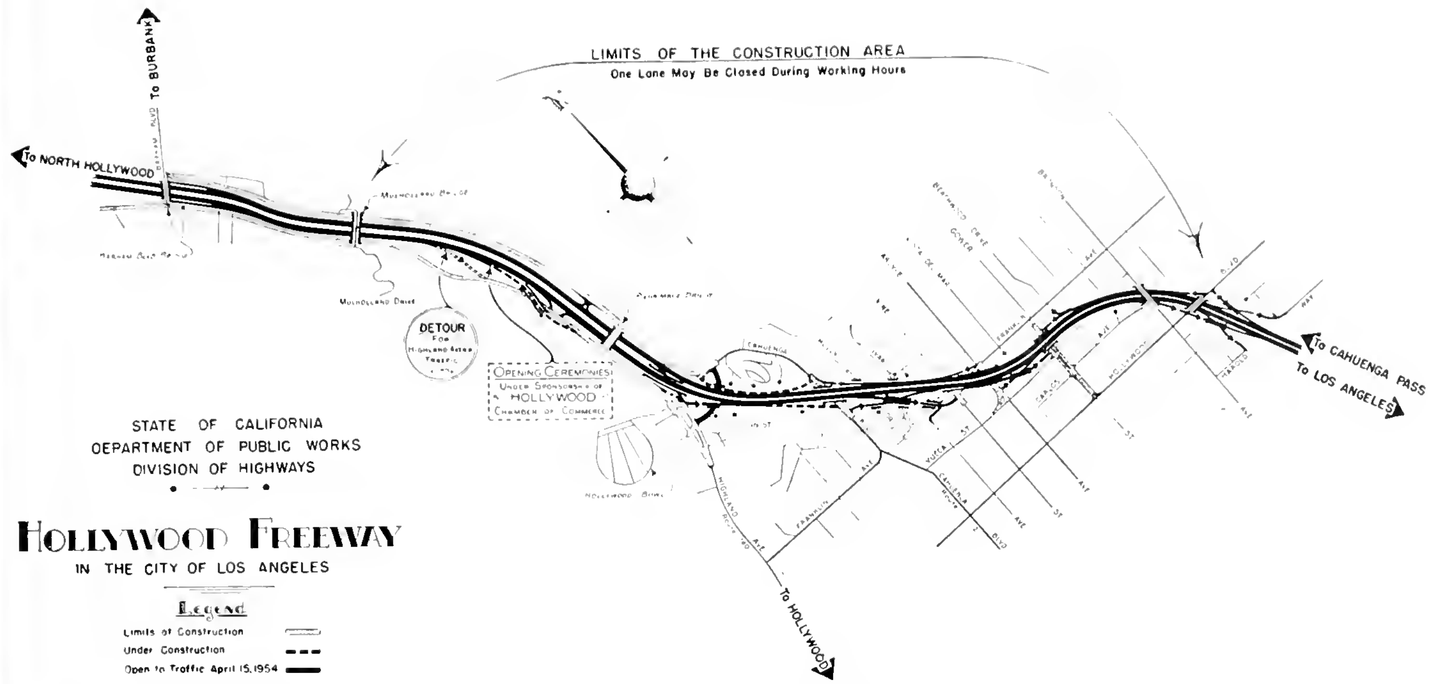
With the completion of this last link of the Hollywood Freeway there are 24 miles of continuous freeway from Pioneer Boulevard, in Norwalk, to Vineland Avenue in the San Fernando Valley that does not have a grade crossing or a traffic light to bother the motoring public.

Official ribbon-cutting group for opening of last link of Hollywood Freeway. LEFT TO RIGHT—Spencer Cortelyou, retired Assistant State Highway Engineer; Paul O. Harding, Assistant State Highway Engineer; Frank B. Durkee, Director of Public Works; Wm. Marsh, Assemblyman, and Bob Hope. The two young men in the foreground are grandsons of the Director, Timothy (left) and Tobin Durkee.

The contractors have yet to do quite a bit of work on gutters, curbs, catch basins, outer highways and the connections with on- and off-ramps. Construction will still be under way on the off-ramp connection for inbound traffic to Highland Avenue between Mulholland Bridge and the Pilgrimage Bridge. Work is also continuing on the connection for northbound traffic between Highland Avenue and the west frontage road; on the off-ramp to Cahuenga Boulevard for inbound traffic; on the on-ramp and off-ramp for outbound traffic connecting with Cahuenga Boulevard in the Whitley Heights area.

The State Division of Highways has expressed its appreciation to motorists for the manner in which they have accepted the 18 stages of detours that have been necessary to complete the complicated construction of this section of freeway.

During the past eight years the Division of Highways and various civic



The last link in the Hollywood Freeway. Although not fully completed, the motoring public will now have the benefit of an uninterrupted highway through Cahuenga Pass. Dotted lines on the map show small portions yet to be constructed.

bodies have worked closely together in the development of this freeway. City and county officials and engineers, chambers of commerce and other interested groups have all done their part in promoting this gigantic job.

Many Changes in Pass

Many changes have taken place in Cahuenga Pass, and in the valleys at both ends during the 44 years since the old Ventura Boulevard was paved through the pass. The original pavement, constructed by Los Angeles County in 1910, was oil macadam. This old pavement was built to the best engineering practice of that day and followed the contour of the land in order to hold to a fair grade. But the grades were steep and the curves were short and sharp.

With the development of the San Fernando Valley and the phenomenal growth of Hollywood this original pavement, which had been the source of much pride in 1910, became inadequate to carry the rapidly increasing traffic load. The area became a part of greater Los Angeles and it was under the engineering department of the city that the pavement through Cahuenga Pass was rebuilt to improved standards about 30 years ago.

In 1940 the City of Los Angeles reconstructed the original road through the pass between Highland Avenue and Barham Boulevard. It was then known as Cahuenga Pass Freeway. Four lanes in each direction with the old Pacific Electric tracks in the center has now become part of the Hollywood Freeway. The limits of the Hollywood Freeway have been set from Vineland Avenue, in the San Fernando Valley, to Spring Street in downtown Los Angeles.

The total length of the Hollywood Freeway is 10 miles and the cost has been $55,000,000.

The first contract on this now completed freeway was awarded on May 28, 1947. This contract provided for the construction of 1.8 miles of freeway from Barham Boulevard to Vineland Avenue. This was a continuation of the work done in 1940 by the City of Los Angeles.

Following that original contract there have been 53 major construction contracts awarded by the Division of Highways of the State of California. The construction costs have been $28,000,000 and $27,000,000 have been the acquisition costs of the necessary rights of way.

ASF FELLOWSHIPS AWARDED

Automotive Safety Foundation Fellowships for graduate study with the Institute of Transportation and Traffic Engineering, University of California, during 1954-55 have been awarded to Robert W. Crommelin, of San Francisco, and Charles M. Roscoe, of Eureka. Both men are with the California Division of Highways.

This will be the third year in which these ASF Fellowships have been available. Walter R. Schroeder and Edgar F. Davis are currently completing their work under the 1953-54 grants. Schroeder was an assistant traffic engineer for the City of Dayton, Ohio. Davis was a junior engineer for the City of Berkeley.

SENSIBLE DRIVING

Use all your senses when you're driving. See what's ahead. Listen for warning signals. Feel trouble, like faulty steering or bad brakes. Smell trouble brewing, like raw gas or dangerous fumes. Then develop your sixth sense—good judgment—and give full time and attention to your driving.

Industry and Freeways

Spectacular Industrial Growth Adjacent to Eastshore Freeway

By JOHN F. KELLY, Headquarters Right of Way Agent

The growth of industry in California during postwar years has been equally as phenomenal as the population increases. The primary role being attained by industry in the economy of the State is the result of a very favorable "industrial climate." That is, the vital factors needed by industry in order to get a start and be able to grow, have been present on the California scene.

The California Division of Highways has been working to provide a network of highways which will best serve the increasing population growth concurrent with the industrial "boom." In the urban areas, the *freeway* has been found to be the answer to present and future traffic needs. Considering the fact that the greatest concentrations of California industry are found in the urban areas, it is essential to know what effect the freeway has upon such a vital part of our economy.

AREA OF STUDY

As a "testing ground" to determine the economic effect of freeways upon industry, a portion of the Eastshore Freeway in Alameda County has been used as a "guinea pig." Freeways are located in many industrial areas throughout the State and almost any one of them could have been used for making this study. However, the 7.5-mile section of the Eastshore Freeway between High Street in Oakland and Lewelling Boulevard, east of San Leandro, provided an opportunity to obtain a sufficient number of property transfers to develop a comprehensive analysis of the economic effect of the freeway upon industry. The section of the Eastshore Freeway where the study has been made shall be referred to hereafter as the "area of study." The accompanying map shows the freeway and the industrial developments in this area. The freeway zone of influence extends a distance of approximately one-half mile on either side of the Eastshore Freeway. San Leandro Boulevard and the property fronting on that street are excluded from this zone.

Freeway Planned

In 1941 the route was adopted for the Eastshore Freeway in the area of study. Although this action was of public record, and the local governing agencies projected future plans for their communities with the proposed new highway facility in mind, it did not become a reality for a number of years. Ultimate completion of the freeway in the area of study was performed by stage construction. Completion of this portion of the freeway was divided into two sections. They were both identical in type, having four lanes divided, with no conflicting traffic movements.

In the short time which intervened before World War II, only a few parcels of land were acquired for the new freeway. This land varied from unfilled marshland to rich farmland suitable for growing nursery stock. At that time there were very few improvements in this area.

Major right of way acquisition for the new freeway started in 1947 and this marked the beginning of full-scale work toward the construction of the freeway.

Other Activity

At this time other events were taking place which were to have a profound influence upon the area of study. In order to fully understand the magnitude of land improvement which was beginning to take place in this area, we must know what motivated the development.

After World War II the industrial growth in the United States progressed more rapidly than at any other time in history. The West figured prominently in this growth, largely as a result of the activity which took place in California. In growth of new industries and every type of industrial expansion, California exceeded the combined totals of all other western states and became the most active single state in the United States during postwar years.

Western Region

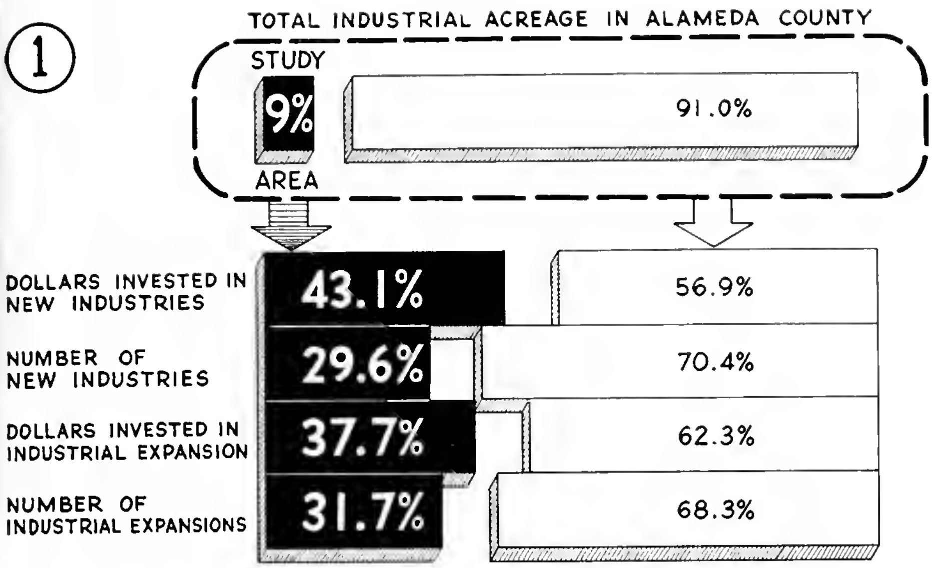
Industries located in the San Francisco Bay area have the advantage of a centralized location in the western industrial market, as well as the benefit of being in close proximity to a large, fast-growing, metropolitan market. The choice of a site among the numerous industrial areas within the Bay region is a matter of selecting the locality which offers the greatest advantages for the successful operation of an industrial plant.

From the standpoint of investments for the postwar industrial development in the nine Bay area counties, the largest expenditures were made on the east side of San Francisco Bay in Alameda and Contra Costa Counties.

Local Development

Considerable acreage suitable for industrial development was made readily accessible to the metropolitan centers of the Bay area by the construction of the Eastshore Freeway south of Oakland. There are a number of industrial areas in the Bay region which have adequate land to accommodate extensive industrial development and expansion; however, no other comparable sized industrial area has attracted so much postwar industrial development as the area of study. This area has often been referred to as a "natural" for industrial development.

A list of the nationally known industries which have located in the area of study during the postwar years looks like a page from the "Who's Who" of industry. The expenditures and number of projects for both the new development and the expansion of industry within the area of study during postwar years are shown in *Diagram 1*. The percentages on the diagram are a comparison of the industrial activity in the area of study



with the remainder of the industrial acreage throughout Alameda County. These percentages represent that share of total industrial activity which has taken place in one area as compared with another, with no adjustment being made for the differences in the size of the areas.

NEW INDUSTRIAL EXPENDITURES

During the past seven years, 43.1 percent of the total expenditures for new industrial development in Alameda County has taken place within the area of study. Average annual investments during this period of time for new industry throughout the county have been in excess of $10,000,000, making it one of the leading counties in the Bay area.

The large expenditure for new industry in the county further emphasizes the important role played by the area of study as an industrial area during the post war years. The greatest significance which can be attached to this area with respect to new industrial development is the fact that it represented only 9 percent of the total industrial acreage in Alameda County. The remaining 91 percent of industrial land in the county accounted for 56.9 percent of the expenditures for new industrial development.

Within the area of study, 75 percent of the expenditures for new industry have been made in the San Leandro section and 25 percent of the new industrial growth took place in the Oakland section. The majority of land in the San Leandro section is readily adaptable for industrial development, whereas a considerable portion of the land adjoining the new freeway in the Oakland section presents greater problems with respect to fill and drainage to prepare it for industrial improvement.

In many cases poor industrial land can compete equally with good industrial land if it has the advantage of better location; however, in the area of study the freeway has made this industrial land as readily accessible despite the greater distance from the metropolitan center.

NEW INDUSTRIAL PROJECTS

The expenditures made for new industrial development within the area of study accounted for 29.6 percent of the total number of new plants started in Alameda County from 1947 through 1953. Percentagewise, the expenditures were considerably greater than the number of new plant installations. This would indicate that larger investments were made on individual plant installations within the area of study than the average investment made for new plant installations in the county.

INDUSTRIAL EXPANSION

It has been said that the srrongest proof of satisfaction with an industrial area is reflected through the investment for expansions to existing facilities.

Industrial expansion consists of such changes as additional floor space for plant operation, increasing the number of production units, and providing new plant facilities.

The average annual investment for the expansion of existing plants during the past seven years in Alameda County has exceeded $20,000,000. Add to this figure the $10,000,000 which had been spent each year for new industries and it brings the total expenditure to $30,000,000 for industrial investments in the county.

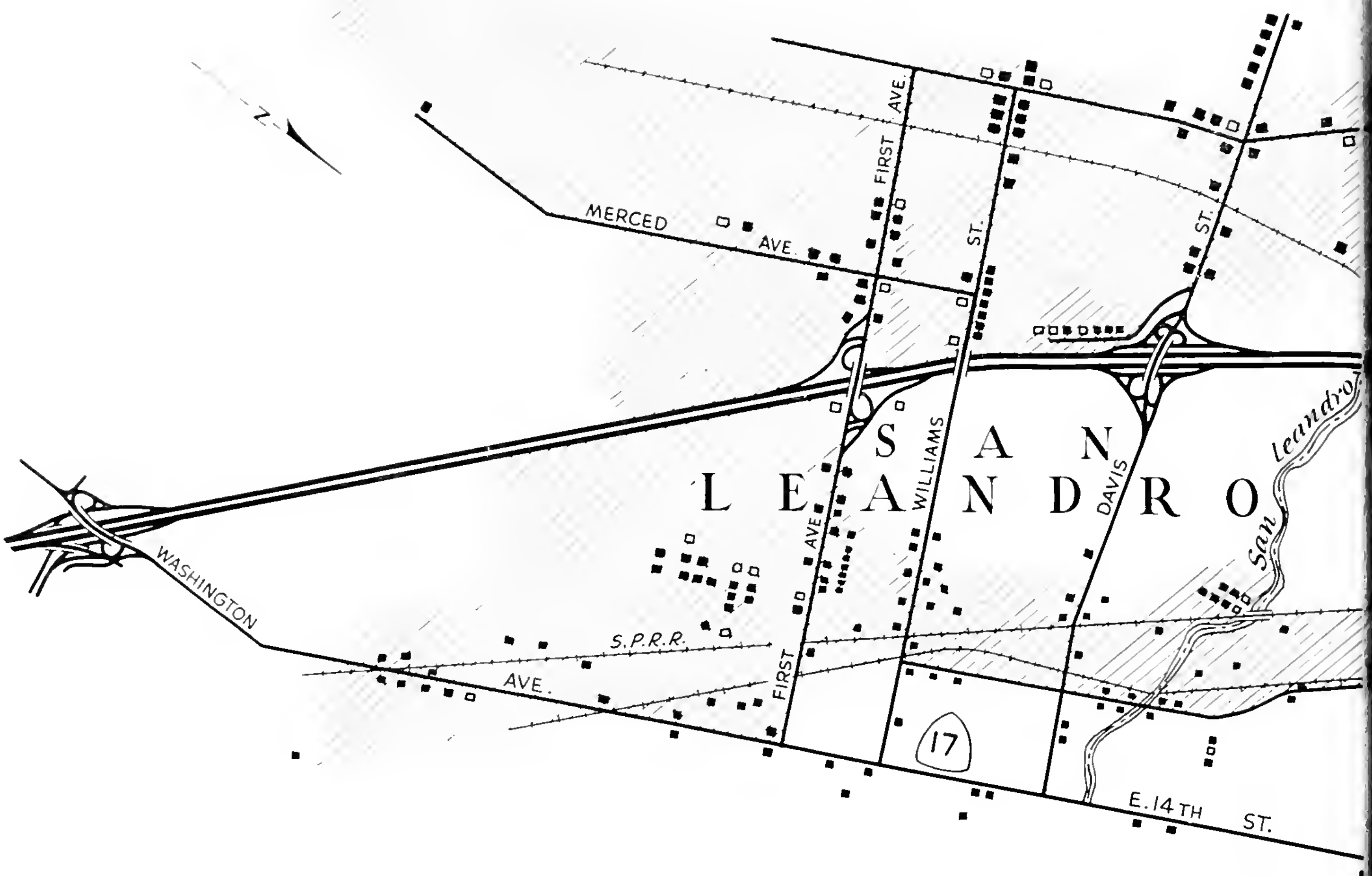
In the area of study the expenditures for plant expansions amounted to 37.7 percent of the annual county expenditures for industrial expansion. The fact that such a sizable portion of the county's record industrial expansion figure is borne by the area of study is noteworthy, not so much because of the large expenditures made in this proportionately small area, but the realization that such a relatively new industrial area would have spent so much for plant expansions. An investigation reveals that many new industries which located in the area of study had made such rapid growth within two or three years that they were already able to justify major expansions.

NUMBER OF EXPANSIONS

The number of industrial plants in the area of study accounted for 31.7 percent of the reported number of projects for the entire county during the past seven years. Like the ratio between the number of new industrial plants and expenditures for new industry, the percentage investments for industrial expansion in the area of study is considerably greater than the number of plants which were expanded. The differences between investment and number of expansions indicate that substantially greater expenditures are being made for individual plant expansions within the area of study than in other industrial areas.

INDUSTRIAL GROWTH FACTORS

This study is primarily concerned with the effect of the freeway upon the location and operation of indusrrial plants. In order to fully understand the relationship of a good transportation system to the plant location factors, it is essential to know what important factors constitute the basic



Freeway shown between High Street and Washington Avenue Interchange near Lewelling Boulevard. Oak
Black squares denote industrial plant locations. The v

needs for a good industrial site. Plant locations during postwar years have relied upon the same basic location factors which have influenced industrial development for many years. The importance of each factor varies according to the development of the area involved.

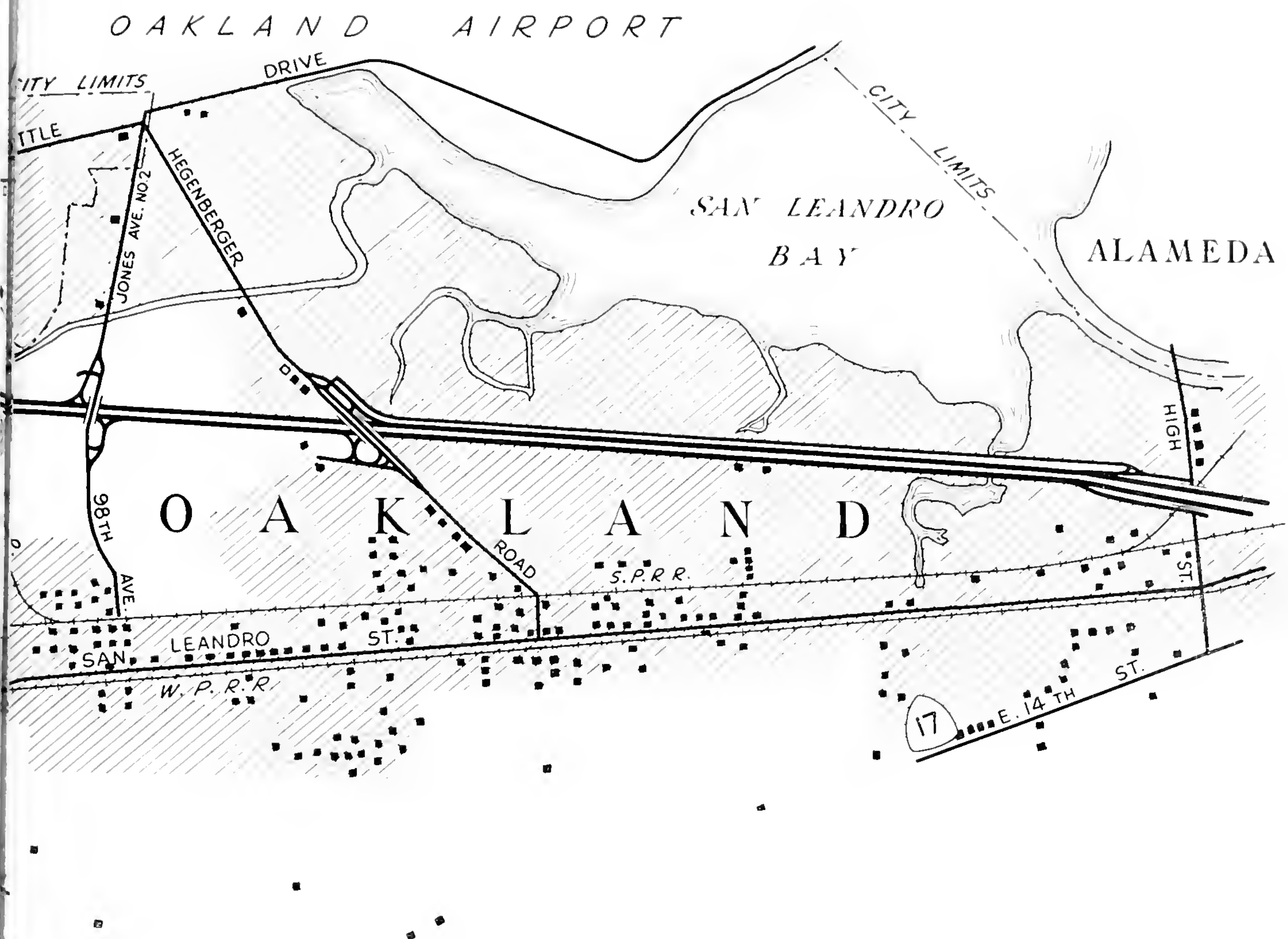
Markets

Markets are generally considered to overshadow all other factors which might be considered by industry in justifying a location in the West. The existence of a large market potential, such as exists in the Bay area, is not singularly capable of justifying the construction of new industries in that area. There must be industrial sites which provide the facilities enabling manufacturers to produce finished goods profitably. This means good transportation facilities, availability of raw materials, labor supply, necessary utilities and a fair tax base.

Transportation

Transportation costs today represent one of the largest expense items of many industries. It is understandable that transportation costs will vary among different industries, but on today's competitive market, industry is confronted with the need of avoiding excessive cost factors wherever possible. A plant location near a large market or a source of raw materials is in effect a consideration of transportation. Perhaps no other factor which must be considered in the selection of a new industrial location is more closely associated with the market.

Industries located within the market area are using truck transportation to a large extent. This type of carrier is advantageous particularly on short hauls or when speed and service are of prime consideration. In order that truck transportation can facilitate a more profitable operation of an industry, there must be a good highway system to serve the industrial area. Many comments have been made by industrialists that a poor highway system which does not facilitate good transportation requires considerably more time for the distribution of goods. The time factor, applied only to wages, becomes a sizable expense item which can be greatly reduced if a good highway facility such as the Eastshore Freeway can be used to shorten delivery time.



limits indicated at top of map. The shaded area is land zoned or planned for industrial development. ares mark locations of proposed new industries.

The dispersion of industrial plants to reach new markets has increased their use of modern highways as a primary mode of transportation over other types of transportation facilities, such as rail and water.

Keeping in mind the profit factor enabling industry to produce locally rather than transport the finished products, it is essential that raw materials are available. An industrial plant located near the Eastshore Freeway in the area of study can be easily supplied with many of the basic materials required such as steel, cotton, lumber and food products.

Labor

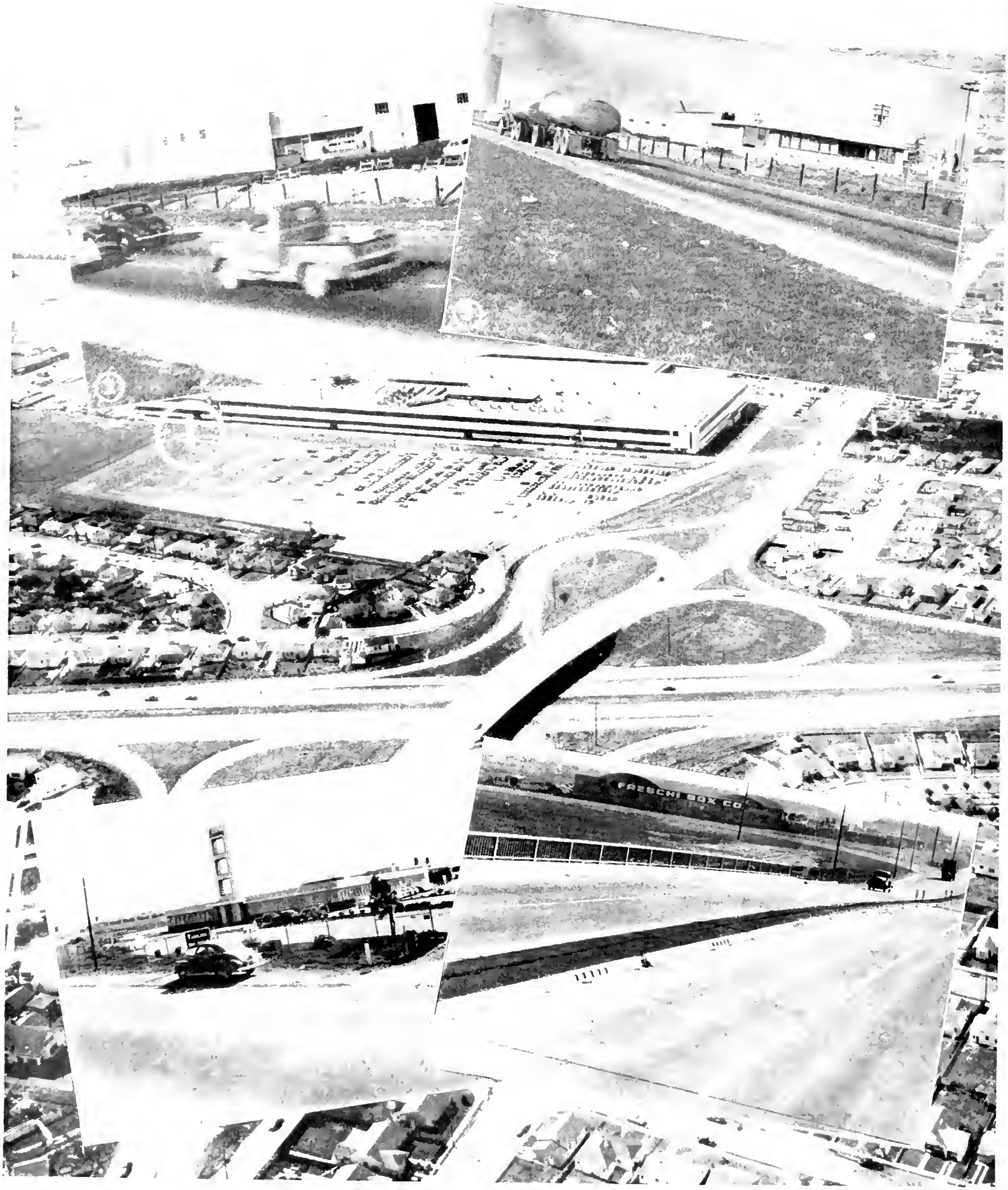
Considerations made for labor supply in locating a plant near the Eastshore Freeway have created no problem in selecting this area for a plant site. Many attractive residential tracts have been developed during recent years adjacent to the Eastshore Freeway. The availability of low cost homes has resulted in the high percentage of home ownership among workers. This opportunity for better living conditions unquestionably promotes a stable labor group for the industries. The extensive residential development adjoining the route of the Eastshore Freeway has been of such magnitude that it warrants an entirely separate study. The construction of this freeway through sparsely improved land opened an altogether new area for the development of home sites for workers in the new local area as well as commuters to other Bay area cities. The new freeway served as an inducement to attract purchasers to buy with the knowledge that they could easily reach their source of employment even though it might change to a different location within the Bay area.

In the area of study, utilities needed for industrial plant operation are available at a cost which conforms with utility rates in other industrial areas.

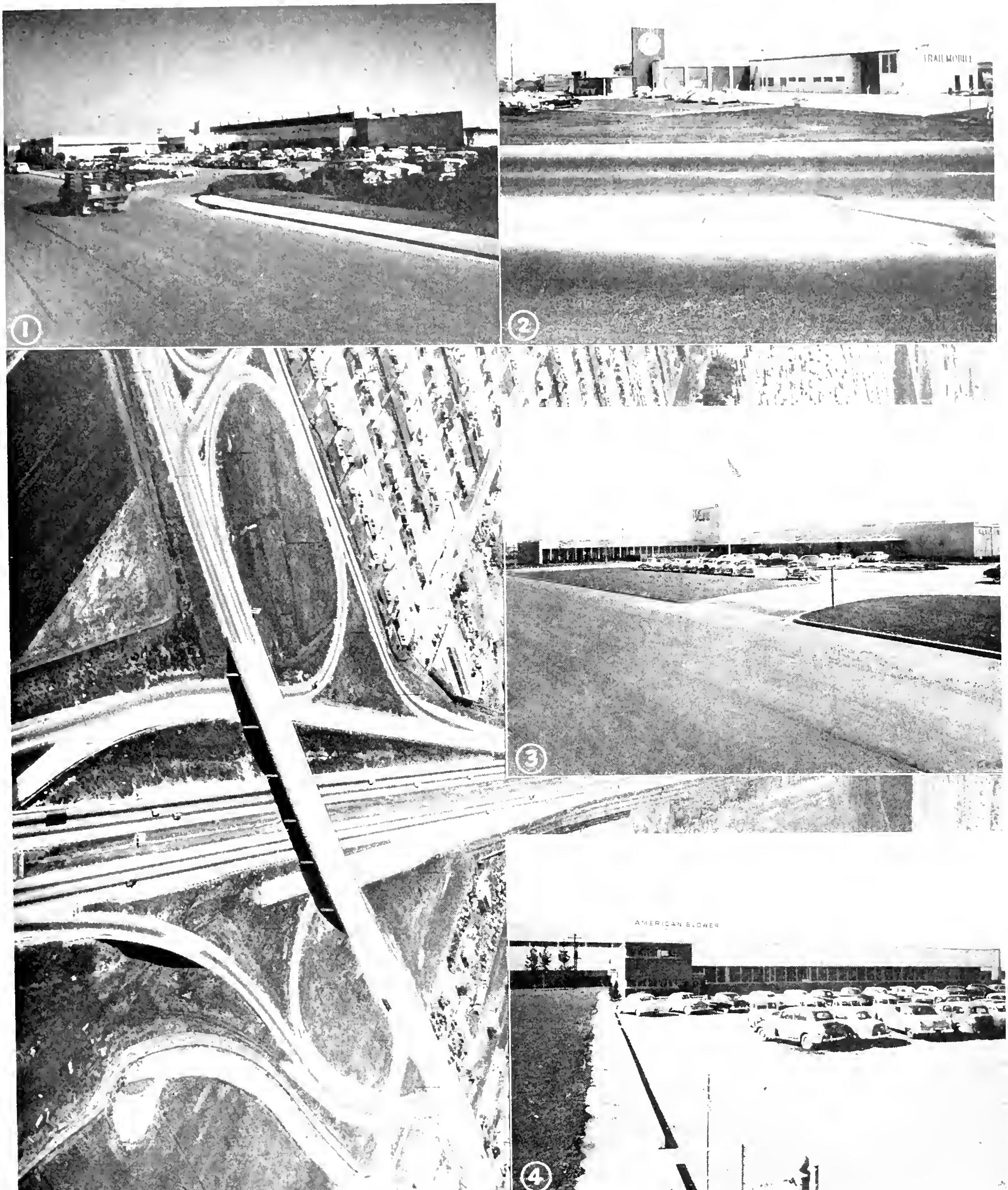
The tax base within the area of study is fair to industry although there are other industrial areas in the county which have a lower tax rate for industry.

LAND VALUES

The desirability of the area of study as an industrial location is evidenced by the tremendous expenditures which have been made for industrial development. The route of the Eastshore



Industries adjacent to Eastshore Freeway: (1) Dodge Automobile Plant, (2) Dean Van Lines, (3) A. O. Smith Company, (4) Lucky Stores Main Office, (5) Freschi Box Company



Industries near Eastshore Freeway in zone of influence: (1) Zellerbach Wax Paper Division, (2) Trailmobile, (3) Republic Supply, (4) American Blawer

Freeway through this land which was devoted primarily to agricultural use, coupled with a period of economic expansion throughout the western states, has caused a complete change in the use of the land affected. The type of improvements which have been made reflect the confidence by investors that the new highway facility is providing an improved and stabilized land condition which has not only been profitable to individual land owners, but has resulted in an over-all increase in the financial stability of the community. The benefits to the community resulting from the land development in the vicinity of the freeway have been through the creation of permanent industrial plants providing steady employment and thereby promoting growth of the entire area.

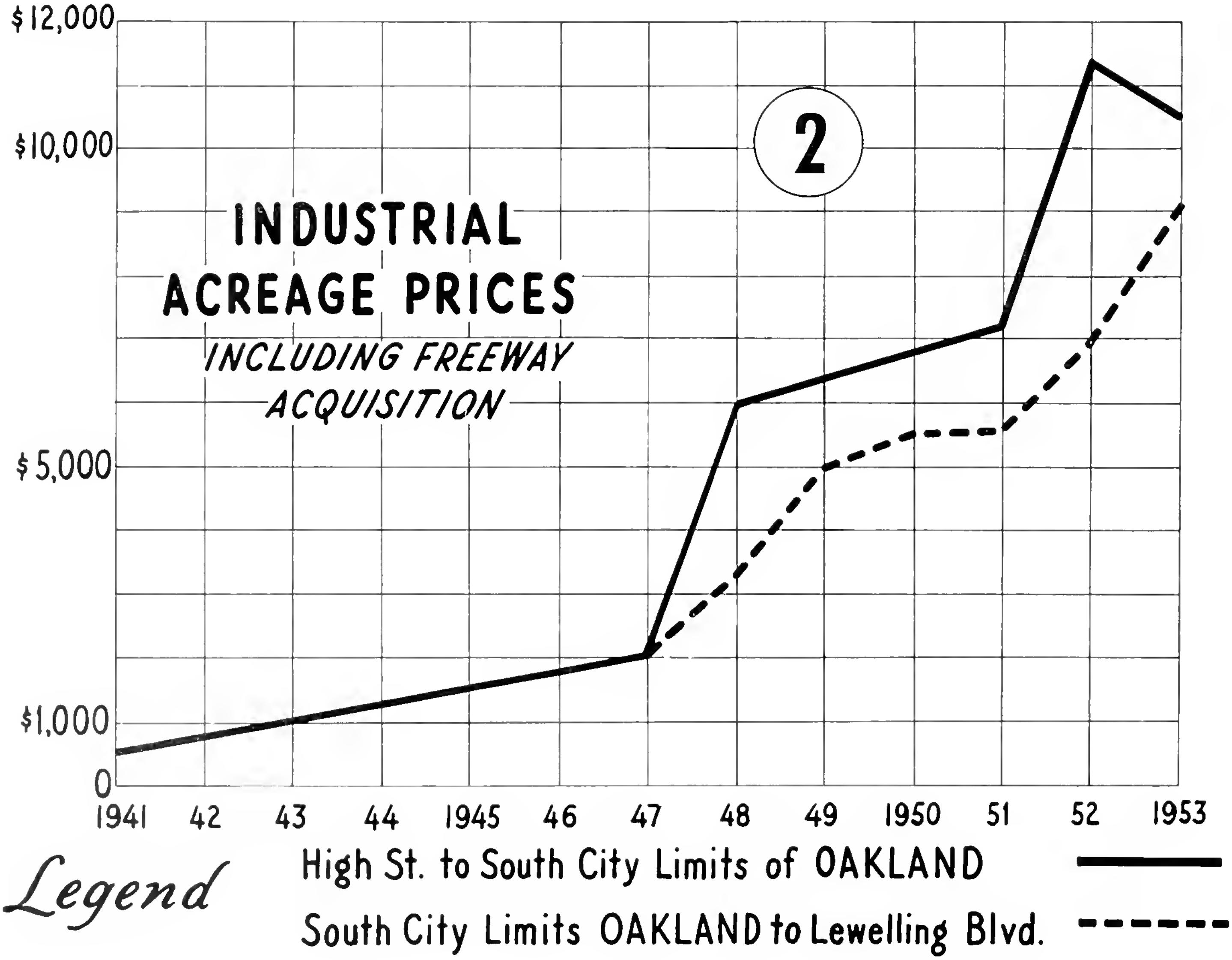
Nothing reflects confidence in an area more than the appreciating land values and substantial investments made to improve that land. The location of an industrial plant has too strong an influence upon its future growth to permit a mistake in the selection of the plant site.

It follows that one of the most positive tests for the determination of the economic effect of a freeway has been the trend in land values as established by industry's selection of sites within the freeway zone of influence. The sales of all parcels of land within this area since 1941 have been available for making this study. When right of way acquisition began on this portion of Eastshore Freeway in 1941 the property sales indicated an average of $500 per acre.

Freeway Reactivated

The war delayed construction on this freeway and it was not until 1947 that the project was again activated and put under construction. At this time, with an actual freeway in sight, acreage was selling at the rate of $2,000.

The 7.5-mile portion of the Eastshore Freeway through the area of study was scheduled for construction in two sections—first construction to begin in May, 1949, on the 3.3-mile length between High Street and the South City Limits of Oakland. The remaining 4.2-mile section, terminating at Lewelling Boulevard, was to be ready for construction in October, 1950. Dividing this portion of the freeway into two sections meant that land acquisition, construction and completion of the first section would



be 1½ to 2 years in advance of the other.

In order to more accurately compare land prices in the freeway zone of influence, the sales of industrial acreage were segregated and a separate analysis made for the two sections of the freeway.

Diagram 2 shows the price trend for land in the area of study from 1941 through 1953. The trend line on the diagram marks the average acreage price for sales within each year. The two trend lines beginning in 1947 show the average land prices in the zone of influence for the first and second sections of the freeway mentioned above.

The trend in land prices has followed a similar pattern in relationship to the progress of freeway construction in each section. The solid line indicating the average land prices in the first section increased sharply after 1947 when an all-out effort began to construct that portion of the freeway. The next sizable increase in the price of land took place after this section of the freeway was opened to traffic. A peak of $11,300 average acreage price was reached in 1952 and has leveled off at $10,500 per acre.

The land influenced by the second section of the freeway, as indicated by the dotted line on *Diagram No. 2* increased in price commensurate with the freeway progress in that area. The trend line shows that the average price for acreage has been somewhat lower than in the first section, however, the price is still increasing and there are no indications as yet of a leveling off in this section. The availability of more industrial sites readily adaptable for improvement in the second section could have been a contributing factor, along with the later development of the freeway, for the slower increase of land prices in the second section.

INDUSTRIAL SUBDIVISIONS

A recent development in the area of study has been the creation of new industrial subdivisions. They offer sites varying in size from approximately one-third acre to several acres. This arrangement is especially suited to the small industries which do not need a large building site but must have the necessary facilities for plant operation. The average current selling price for these industrial "lots" in the improved subdivisions is 50 cents per square foot without rail facilities and 60 cents per square foot with rail. Converting these prices to acreage figures they amount to $21,780 and $26,136 per acre. Although they are in a completely different price level than the acreage figures shown on *Diagram 2*, these lot prices are not unreasonable considering the fact that the purchaser does not buy more than he needs.

The highest prices asked for land in the industrial subdivisions have been for lots adjacent to the freeway. Property near the freeway commanded bonus prices because of the advertising value or advantage of being more accessible to the freeway.

CONCLUSIONS

The "test area" used in making this study to determine the economic effect of a freeway upon industry has conclusively shown that:

1. The new growth and expansion of industry within the freeway zone of influence has far exceeded the industrial activity throughout the remainder of a county whose greatest source of income is from industry.
2. The Eastshore Freeway stimulated the development of the adjacent land by attracting both industry and residents. This change in land use has been not only profitable to the property owners near the freeway but the entire community has benefited through this improvement.
3. The trend toward dispersion in plant location and greater use of truck transportation has created a demand for industrial sites outside some of the older established industrial areas. Land available for industrial development near the freeway has experienced a location preference over other unimproved areas not having a freeway nearby.

Twenty-five Years of Service Rewarded

At a District VII staff meeting on April 27th, Assistant State Highway Engineer Paul O. Harding in Los Angeles awarded 25-year service certificates and pins to five employees of the Division of Highways.

The recipients as shown in the above photograph are:

Loren F. Phillips, Senior Highway Engineer; Harold S. Throckmorton, Associate Right of Way Agent; E. F. Wagner, Deputy Chief Right of Way Agent; F. E. Sturgeon, Highway Engineering Associate, and Emil G. Hanson, Supervising Highway Engineer.

Eugene Burge, Assistant Highway Engineer, was out of the State at the time of the presentation and will receive his award later. Mr. Harding himself recently received his 25-year service award from State Highway Engineer George T. McCoy.

THIRD ANNUAL BONNEROO IS OBSERVED IN DISTRICT VII

By CHARLES L. GILDERSLEEVE, Senior Highway Engineer

The Construction Department of District VII, Division of Highways, held its Third Annual Bonneroo (Bonne rue) Stag Party at the Rodger Young Auditorium, Los Angeles, on the evening of May 7, 1954.

Over 500 Division of Highways employees, representatives of contracting firms, construction equipment companies, materials suppliers, and engineering publications, were present.

R. M. Gillis presents trophy to Tom Polich

The purpose of these annual parties is to honor contractors and resident engineers and assistants who completed the 10 best contracts in the district during the previous calendar year; to promote a spirit of friendly rivalry and competition among both engineers and contractors to produce the best work; and to provide an opportunity for all concerned to become better acquainted.

The contracts are rated on the basis of excellence of workmanship in the various items of work, smoothness of the finished road, low engineering cost, good public relations, and other factors.

After introduction of the guest, Fahey presented Tom Tayrien a $10 cash prize for having submitted the winning name, in a contest to name the trophy awarded each year to the contractor, and to the resident engineer, on the best contract completed during the previous calendar year. The name chosen by the judges was "*Topper.*"

Cressy then announced the best contracts for 1953, numbers 10 to 2:

(10) Hollywood Freeway, Cahuenga Boulevard to Gower Avenue. Winston Bros., contractors; C. J. Woodridge, Resident Engineer.

(9) Santa Ana Freeway, Orr-and-Day Road to Pioneer Boulevard. Ukropina, Polich, & Kral, contractors; B. N. Frykland, Resident Engineer.

(8) Santa Ana Freeway, Eastman Avenue to Atlantic Avenue. Winston Bros., contractors; H. E. Belford, Resident Engineer.

(7) Ramona Freeway, Hellman Avenue to Eighth Street. Griffith Co., contractors; B. N. Frykland, Resident Engineer.

(6) Hollywood Freeway, Hollywood Boulevard to Western Avenue. Webb & White, contractors; R. A. Collins, Resident Engineer.

(5) Santa Ana Freeway, Todd Avenue to Lakewood Boulevard. Ukropina, Polich, & Kral, contractors; Haig Ayanian, Resident Engineer.

(4) Newport Avenue, Pacific Coast Highway to 20th Street. Sully-Miller Contracting Co., contractors; J. L. Needham, Resident Engineer.

(3) Santa Ana Freeway, Augusta Avenue to the Rio Hondo. Ukropina, Polich, & Kral, contractors; Haig Ayanian, Resident Engineer.

(2) Ramona Freeway, Helen Drive to Hellman Ave. J. E. Haddock, Ltd., contractors; B. N. Frykland, Resident Engineer.

D. G. Evans presented framed photographs of the trophies the 1952 winners had held for the past year to Skinner for A. Teichert & Son, and to Carr, Resident Engineer, as permanent mementos of their awards.

Climax of the ceremonies was reached when Gillis announced the number one contract for 1953, the Santa Ana Freeway from Washington Boulevard to Todd Avenue, and presented miniature golden roller trophies, appropriately called Toppers, to Tom Polich for the contractors, Ukropina, Polich, and Kral, and to Haig Ayanian, Resident Engineer.

Carl Rice, Superintendent, and Jack Yount, Project Manager for the contractor, and the following assistant resident engineers were each awarded a certificate signed by Harding, Fahey, and Cressy, in recognition of their respective contributions to the construction of the best contract: Ralph

Paul O. Harding presents trophy to Haig Ayanian

Palmer, Principal Assistant, L. J. Trombators, Joe Palmer, T. A. Roseberry, Deane Bowers, M. S. Lefton, R. P. D'Alo, Oliver Burke, A. P. Lund, A. J. A. Lynn, L. B. Munro, C. G. Bork, J. D. Stoddard, H. B. Lew, I. Varon.

The Bridge Department representative was J. M. Curran; Materials Department representative, R. J. Hagstrom; Survey Department representatives were Chiefs of Party Wayne Short and Elmer Smith. These men were also awarded certificates.

Freeway Benefits

Oceanside-Carlsbad Project Relieves Congestion and Reduces Accidents

By M. H. WEST, District Traffic Engineer

The last contract for constructing the US 101 Freeway between Leucadia and Oceanside was completed in November, 1953.

Traffic counts in December, 1953, indicate that had the freeway not been in existence, the state highway which it replaced would have carried an average of 19,000 vehicles per week-day.

Data developed from the December count indicates substantial relief from congestion on the former state highway. Sixty-three percent of the average week-day traffic was removed from the former route, thus relieving acute congestion and providing freedom of movement for those vehicle drivers desiring to use the old route for business or other purposes.

Traffic Volumes Increase

Traffic volumes on the new freeway have increased nearly 20 percent since its opening to traffic.

Week-day volume counts were taken on this freeway in December, 1953, soon after its opening, and again in April, 1954. Average daily week-day traffic on the Leucadia-Carlsbad portion in April is 14,200 vehicles, an increase of 19 percent over the December volumes, and 13,700 vehicles per day on the Oceanside-Carlsbad portion. The latter counts are 17 percent higher than those made last December. These increases closely agree with those observed in traffic counts taken in December and April on US 101 in Del Mar.

In addition to the comfort and convenience offered to motorists desiring to pass through the Carlsbad-Oceanside area, this freeway also serves traffic desiring to enter or leave the principal streets in these cities by means of 10 traffic interchanges.

Major Interchanges

Four major interchanges provide for the turning of traffic from US 101 into Carlsbad. The Las Encinas interchange at the south end of Carlsbad diverts 965 northbound vehicles per day to the US 101 Business Route (former US 101 along the coast). At the Elm Avenue interchange, 220 vehicles per day turn west into Carlsbad from the south and 480 vehicles turn west into Carlsbad from the north. The Tamarack Avenue interchange presently accommodates 230 vehicles per day leaving the freeway from the south and 320 vehicles per day leaving from the north; 390 southbound vehicles leave the freeway at the Las Flores interchange and 50 per day leave from the south.

Six locations in Oceanside provide for the interchange of traffic between the freeway and principal streets in Oceanside. Interchanges at Vista Way,

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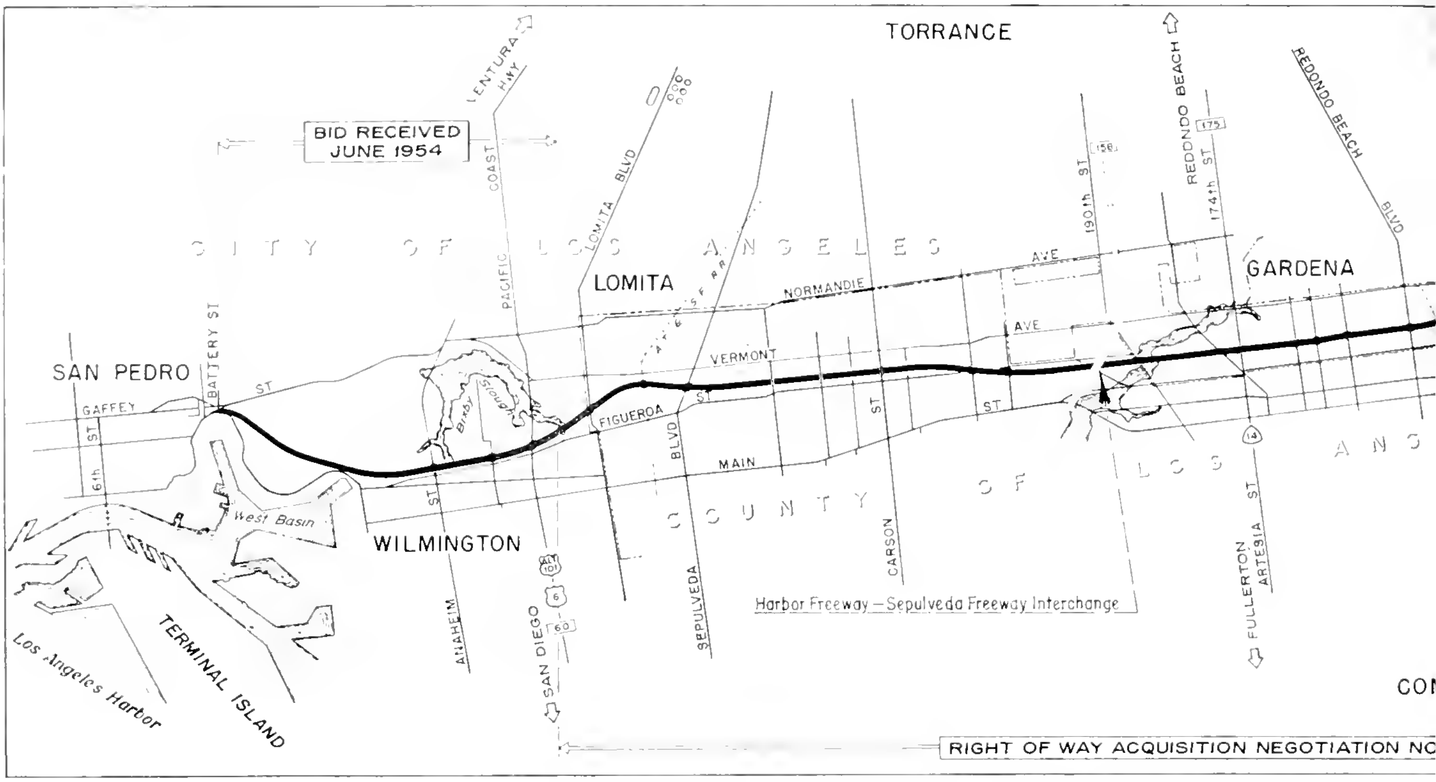
This photo gives an excellent idea of how the Oceanside-Carlsbad Freeway was constructed to provide a safe facility for heavy traffic



Harbor Freeway

Continued from page 15 . . .

attention was the wrecking of the modern reinforced concrete office building located at Sixth Street and Beaudry Avenue that housed the Ethyl Corporation. From Olympic Boulevard southerly to Santa Barbara Avenue many large business establishments, church properties and multiple unit apartments were encountered. St. Vincent's School building at the corner of Adams Boulevard and Flower Street had been demolished. Southerly of Exposition Boulevard the freeway location is through an area of older houses that some of the occupants have owned for 30 years or more. Some of the occupants are older people who expected to live in their homes the rest of their lives. It would be assumed, in approaching owners of this type, that one would meet with tears, hesitation, reluctance, and perhaps outright defiance when asked to move. This is not the case. The older folks seem to have resigned themselves to the fact that they should not stand in the way of progress and gladly cooperate. This is the rule rather than the exception. We have met with wholehearted cooperation and support many times where least expected.

Right of Way Procedure

Taking it all in all, right of way acquisition has been difficult due to

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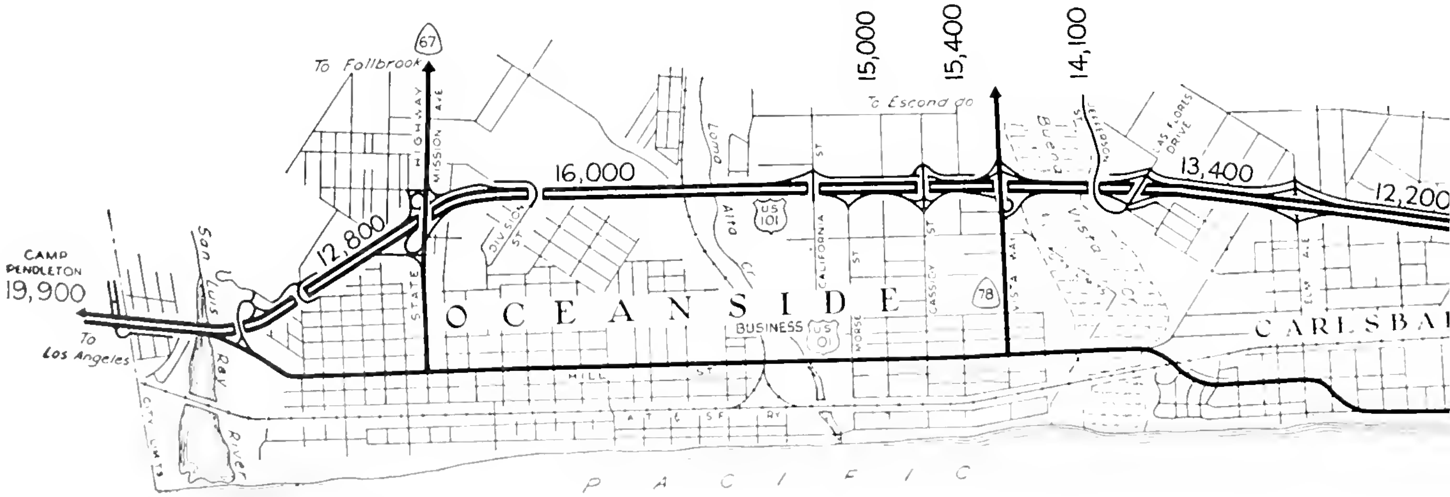

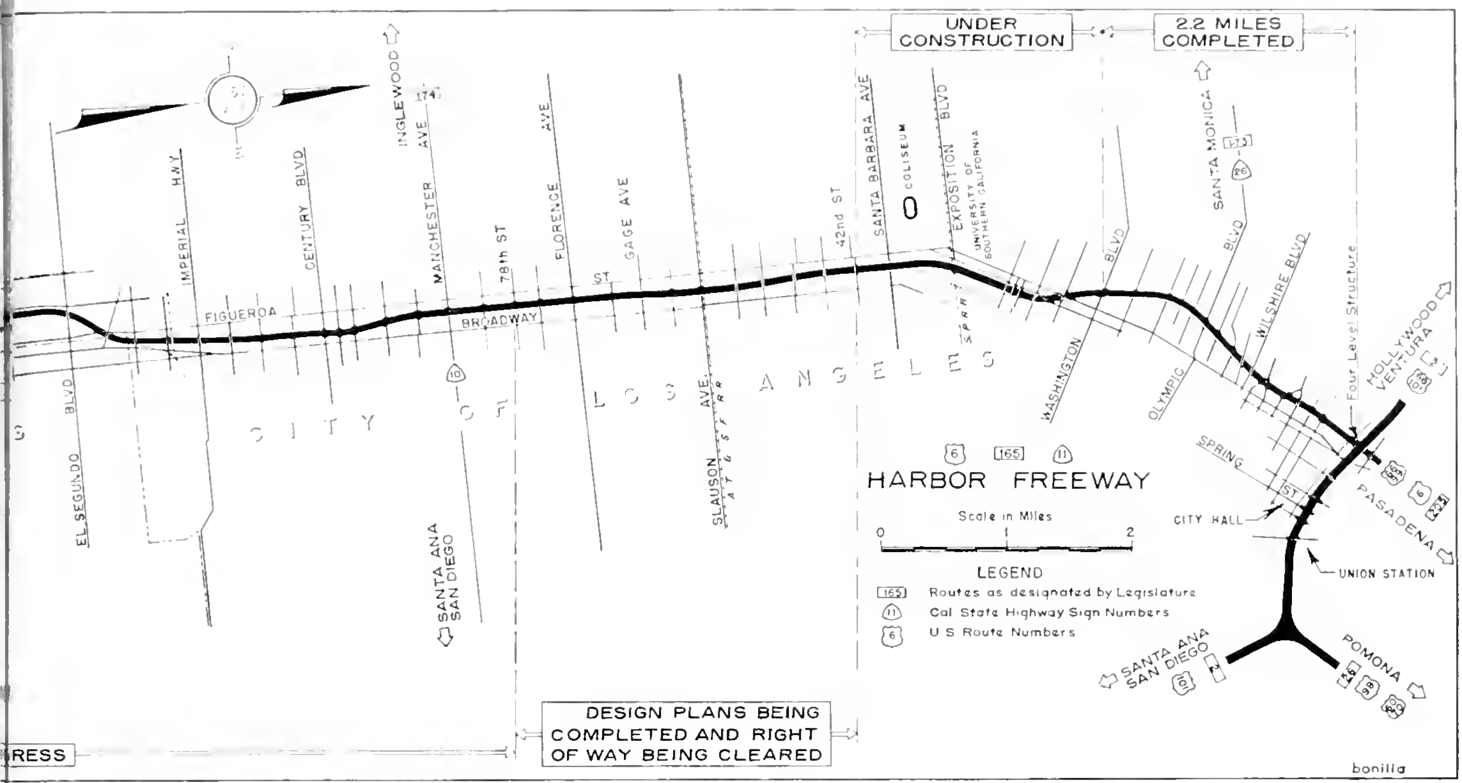

Freeway Benefits

Continued from page 31 . . .

Mission Avenue, and Hill Street are the three important traffic handlers.

Some 4,000 southbound vehicles per day were counted leaving the freeway at the Hill Street interchange bound for the Oceanside downtown area. Also, 300 additional southbound vehicles entered the downtown area via the Mission Avenue interchange. Drivers of these vehicles undoubtedly preferred traveling to the downtown area via the freeway and Mission Avenue rather than travel south on Hill Street between the San Luis Rey River Bridge and Mission Avenue.

Turning Movements

The Mission Avenue interchange also handles a substantial volume of northbound freeway traffic turning west into the Oceanside downtown area. This turning movement is 1,460 vehicles per day.

The principal turning movement at the Vista Way interchange is from the north on US 101 to the east on State Sign Route 78. This movement, formerly at the signalized intersection at Vista Way and Hill Street, is 1,030 vehicles per day. The freeway has relieved Hill Street of this traffic. Traffic movement into Vista Way west from the north is 190 vehicles per day and from the south 440 vehicles per day. These significant volumes again

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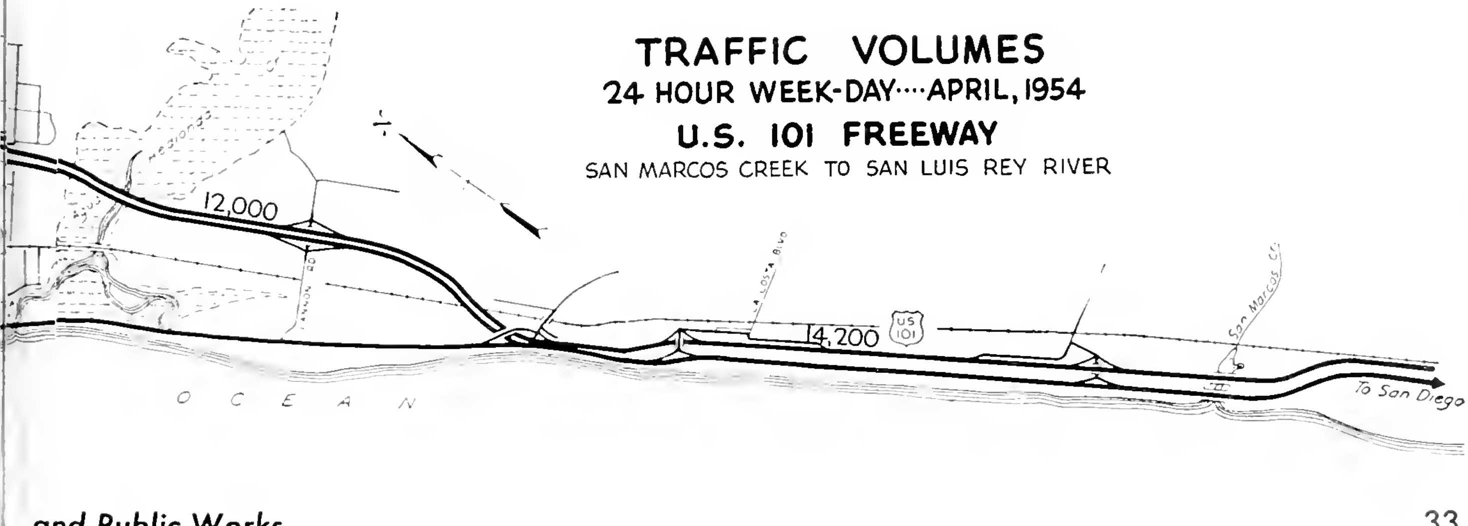


Barrier Curbs

Impact Test Program Proves Most Valuable

By J. L. BEATON, Supervising Highway Engineer, Materials and Research Department

The development of the metropolitan freeway with its multiplicity of overcrossings and undercrossings has been one of the wonders of our age and is naturally the pride of the highway engineer. Its development has not been by chance. It has been only by the hard work of sifting known facts and applying them by engineering judgment that its development has been possible.

One of the areas in which more facts are needed is for the engineering design of barrier curbs which are used on the various bridges involved in the over- and undercrossings. With this in mind the California Highway Commission in November, 1952, voted funds to support a study involving dynamic impact testing of several different designs of roadway curbs, primarily of the barrier type.

The problem of obtaining factual information so as to compare the 11 different designs of curbing shown on the accompanying sketch was assigned to the Materials and Research Department. A program was immediately outlined and during December, 1952, a test site was selected, the curbing was constructed and a standard stock car sedan was converted into a test vehicle.

Actual Tests Started

The actual testing of the curbs was started in January of 1953 and completed in May of that year. During the balance of the year the data and moving picture film taken during the tests were analyzed and a report prepared.

Full scale impact tests are not new, having been run on various guard rail designs by the Missouri Highway Department. There also have been reports of other tests on guard rail installations and curbings. However, no record was discovered of similar systematic tests having been performed on barrier curbs.

E. W. Kessinger, Test Driver, shows safety features of car. These include safety belt, crash helmet, welded pipe bracing back seat removed and front seat fastened down by direct ties to frame.

Test Location

The Franklin Airport, situated about 25 miles south of Sacramento, was chosen as the test location. One of the airport runways supplied enough space to test 500 feet of curb with ample room to accelerate and decelerate the test car to the desired speeds. The plan of the test site is shown by an adjacent sketch. The curbs were constructed to the profile dimensions shown on the cross-section plan. Each curb type was 100 feet long. In order to provide the 11 different types a width of curbing of three feet was used with a different design on each side. One extra design was provided by placing a metal face on Curb VI. This provided data concerning the effect of changing materials. The faces of the curbs were plain, not indented.

The test car used in this series of impacts was a 1949 Ford sedan that had been surveyed by the Equipment Department for sale. The sedan was converted into a suitable test car by adding bracing very similar to that used in the hardtop racing cars. In addition a survey speedometer and a camera to record curb contact speeds were added to the vehicle.

Experienced Driver

An experienced test driver, E. W. Kessinger of Sacramento, and incidentally an employee of the Bridge Department, was hired by service agreement to drive the test car. One of the many factors which contributed to the excellent objectiveness of the data collected during this project was the uniformity of Kessinger's driving, and his strict adherence to his driving directive. The driver worked under the instructions that he was to make his approach at the speed and angle required for the particular test and that he was to control the car with a normal hand hold on the steering wheel and not force control of the vehicle until after the car had completely contacted the curb. After completion of contact with the curb he could then try to gain control of his vehicle.

The curbs were contacted at angles of approach of 5 degrees, 10 degrees, 15 degrees, 20 degrees and 30 degrees and at speeds of contact from 5 to 50 miles per hour. Not all curbs were tested at all angles and speeds since any series of tests were discontinued either when the car mounted the curb, or when it was evident that damage was so extensive that no further comparative value would result, or when it seemed probable that the car would overturn with any further increase in speed.

Speed of Approach

The driver was given his speed of approach verbally before each test and in addition it was posted on the dashboard along with other identification of the test. The speed of contact was checked by a picture taken of the speedometer and of the posted identification just before collision. The angle of approach was defined for the driver by laying a white, webbed belting 2 inches wide and 160 feet long at the appropriate angle with the curb.

The record of each test contact was made by two technical observers and the driver. This trio listed all measurements of contact and physical damage both to the car and the curb and then recorded their observations on a voice recording machine. All physical damage to the car was appraised by the test mechanic, A. R. Hatton of the Equipment Department.

In addition each test was recorded by three motion picture cameras. The cameras were placed as shown on the site plan sketch. Two of the cameras, identified as the "parallel" and the "normal" camera, took slow motion pictures while the third camera, called the "oblique" camera, recorded at normal speed.

Typical Test Run

A typical test run went like this: The motion picture cameras were titled with the curb type, angle, speed of approach and date of the test just before the start. While this was going on, the webbed belting was set in proper position so as to guide the car into the curb, and a trigger block was set so as to trip the solenoid switch in the car which in turn tripped the speedometer camera. On completion of these preliminaries the driver made his approach, and if his speed and angle were correctly adjusted, continued until contact with the curb. If his angle was incorrect, the observer waved him off. If his speed was incorrect, the driver himself would turn off before collision.

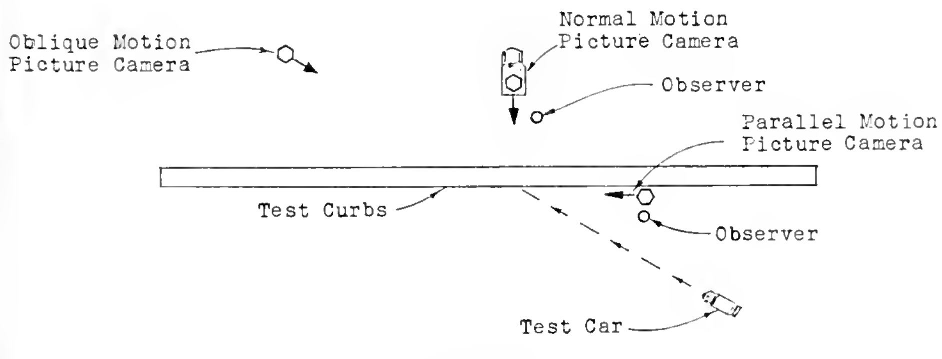
After completion of the test the observers and mechanic inspected the curb and car and ascertained the contact made, damage to the car, type of damage caused by contact, and then immediately recorded all data, comments and information obtained by visual observation. In addition the driver recorded his exact reactions and ability to control the car both before and after contact. The mechanic immediately made a complete recheck of the car and appraised the damage caused by the particular test collision. The car was then taken to the alignment frame and an accurate check made of the wheel alignment and camber. The car was then immediately repaired either by correction, by replacement or repairing the damage. It is interesting to note that Art Hatton, automobile mechanic from Headquarters Shop, became so proficient at front end repairs that he could remove and replace an "A" frame and realign the car in less than 20 minutes. Colored slides and physical measurements were taken of the tire contact marks on the curb while the car was being repaired and readied for the next test.

Totol of 149 Collisions

The outer sides of the front and rear contact tires were painted with cold water paint, the front tire red and the rear tire green. This paint readily rubbed off on the curb showing the tire contact and roughly the height of the climb. This is the marking that was measured. There were 149 collisions made with the curbs. This resulted in the use of 12 "A" frames, 10 wheels, 1 king pin kit, 1 set of tie rods, 1 set of coil springs, and 2 tires to replace damaged parts. There were no injuries to personnel during the entire series of tests. This was due to the fact that several safety precautions were taken before starting the test such as reinforcing the automobile and the use of a safety belt and crash helmet by the driver. In addition the danger of a fire in case of the car rolling over was considered, and men were assigned to stand by with fire extinguishers during each collision; also only sufficient gasoline to complete the run was used in the car. A man was also assigned to assist the driver in getting out of the car in case of a serious accident.

Results Interesting

The results of this test program were interesting. It should be emphasized that the purpose of this study was to cover only the investigation of the behavior of the 11 different designs of curbing shown on the accompanying plate and was not for the purpose of developing new designs. Of the 11 different designs it will be noted that all but one are generally considered to be barrier curbs. The one exception, Curb X, Division of Highways Standard Type B, sloped 4 inches in a 6-inch height, was constructed only to check the opinion that it was mountable. It was found to be easily mounted; however, it was the opinion of the observers that this slope is about as steep as will allow a vehicle to mount at average high



PLAN OF TEST SITE

The above photographs show the general operations used to conduct the curb test program. Photos 1, 2 and 3—Details of concrete curb construction. Photo 4—Mechanic checking back wheel of test vehicle. Photo 5 Damaged front wheel. Photo 6—Front contact wheel being cleaned and painted. Photo 7—Collision with Curb VI-M. Photo 8 Imprint from painted tires which left data of mounting characteristics. Photo 9—Collision with Curb III. Photos 10 and 11—Measurement of tire imprints. Photos 12 and 13 Scenes of before and after test collision. Photo 14 Inspection of car damage.

speeds with no damage to the vehicle. It should be emphasized here that the data accumulated during this test primarily concerns only the effect of the curb and does not necessarily indicate what reaction a normal or average driver might have after colliding with a curb.

Of the barrier curbs the 9-inch-high test Curbs V and VI-M and the two 12-inch-high Curbs VIII and IX, proved to be the most efficient. However, each has its limitations as well as its good points. At angles of collision of 5 degrees, 10 degrees and 15 degrees Curb V proved to be over-all the most effective type. This curb not only prevented climbing at these angles of approach but also acted as an external brake on the forward motion of the car. This latter action also caused postcollision travel of the car to be close in and parallel to the curb. Mounting of this curb was relatively easy at the 20-degree and higher angles of approach.

Differences In Curbs

Curb VI-M, the metal-faced round-nosed undercut curb, was more efficient than Curb V when considered only as a barrier. It had two drawbacks. The first is that there was little or no retardation of the velocity of the colliding vehicle. The second is that there was a "tripping" action of the vehicle at the higher speed. Lack of retarding action of this curb resulted in the test car ricocheting off the curb at an angle and speed very nearly equal to the approach angle and speed of the test run.

This Curb VI-M was tested at angles up to 20 degrees and at speeds up to 45 miles per hour. The vehicle did not mount nor even partially climb the curb at any time during the test. However, any further increases in speed probably would have resulted in overturn of the car. It is interesting to note that identically shaped Curb VI with a plain concrete surfaced face served as a barrier to the vehicle only at low angles and speeds. It was mounted immediately at all angles above 5 degrees, and even at 5 degrees it was mounted at 30 miles per hour. The only difference between Curb VI and VI-M was the metal facing which was added to VI so as to create VI-M.

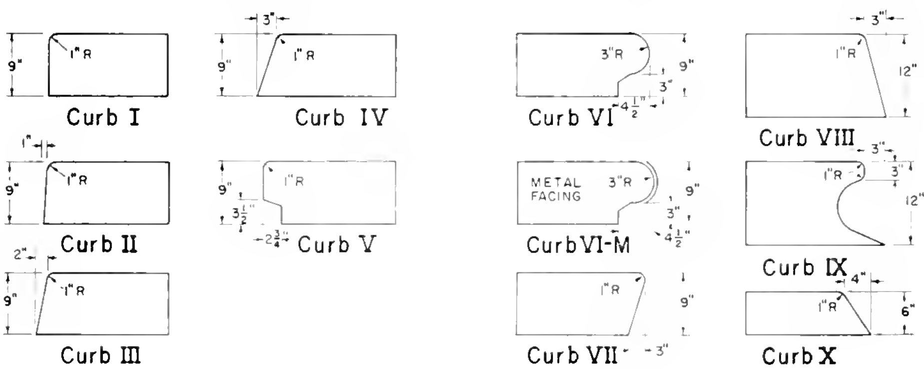
The two 12-inch-high test curbs also proved to be effective barriers. However, neither had the braking effect of Curb V nor was any more effective as a barrier than Curb VI-M, except that the "tripping" action was not so evident. There was an indication by the modified ogee shaped Curb IX that a rail located at hub center height may be very effective as a barrier. However, such a rail probably would have to be armored so as to withstand the collisions and resist the biting action of the rim.

Curb III Most Successful

The effect of changing the slope of the face of a 9-inch-high solid concrete curb was clearly indicated by Curbs I, II, III, IV and VII. The first four of these 9-inch-high sloped curbs were sloped from the base at various angles from vertical to 3 inches back from vertical. Curb VII was sloped forward 3 inches from the vertical. Of this group Curb III proved to be the most successful. This is the Division of Highways Standard Type F. Its performance very nearly matches the undercut vertical Curb V except that partial climb occurred at lower speeds and angles of approach, and there was little braking action by the curb evident during contact. Of this group the forward sloped Curb VII proved to be the least efficient as a barrier in that its leading edge served as a pivot for the rim to bite into and lift the wheel up over the curb. Also the damage to the wheel by this curb was severe.

As stated before this program was limited to the investigation of the comparative barrier efficiency of the 11 illustrated curb designs only; and while the data cannot necessarily be applied toward completely new curb designs, it can be interpreted for use in improvements of the existing designs as well as displaying their relative efficiencies. A 30-minute moving picture has been made by editing the various test pictures made during the program. This picture is available to the districts for showing on request.

The objectiveness of this test is a tribute to the excellent field supervision of the project by H. A. Peterson, Assistant Physical Testing Engineer.



These curbs were tested and ----

----of the 9" high curbs these two proved most efficient.

ENTERING HIGHWAYS

Be especially careful when you're entering a high-speed highway from a driveway, or side road. It is better to let fast-moving vehicles pass than to insist on exercising your right of way and risk the chance of a collision. Remember it's always safe to wait—never safe to make a break!

PREVENT PARKING DELAY

When you park at the curb in a congested downtown area, always signal your intentions and back into the space in one movement. You'll save yourself the embarrassment of jamming up traffic if you learn to park properly with the minimum of time and effort.

Petaluma Bypass

Two Bridges on Project Will Be Highest of Kind in State

A MAJOR BOTTLENECK on US 101, the Redwood Highway, is now being eliminated by the construction of a five-mile bypass around Petaluma in Sonoma County.

US 101 has previously been constructed as a freeway through Marin County and northerly into Sonoma County as far as Petaluma. However, the present state highway location through Petaluma follows Main Street and Third Street, both congested city thoroughfares, with attendant confusion, inconvenience, delay and hazard.

The location for the freeway route is to the east of Petaluma. This necessitates a crossing of Petaluma Creek (a navigable waterway at this point), and several crossings of the Northwestern Pacific Railroad.

Project in Three Units

The bypass is being constructed in three units. The first unit consisted of earth fill approaches for the twin Petaluma Creek bridges at the southerly end of the project. The Petaluma Creek bridges constitute the second unit. Bids for the third unit, consisting of all remaining structures and all grading and paving, were received on May 19, 1954, with Parish Bros. and Carl N. Swenson Co., Benicia, the low bidder with a proposal of $3,425,225.20. Total cost of the three units will be about $6,000,000, and the bypass freeway should be opened to traffic in the summer of 1956.

The quantities of the various grading and paving items to accomplish

ABOVE—Looking southerly at Petaluma Creek Bridge and Overhead during construction. Channel must be kept clear for navigation at all times. On far bank is Northwestern Pacific spur line into Petaluma.

BELOW—Looking northeasterly at Petaluma Creek Bridge and Overhead during construction. North approach fill and abutment excavation on far side of creek. Northwestern Pacific Railroad Bridge at lower right.

Looking easterly at Petaluma Creek Bridge and Overhead during construction. Present Redwood Highway (US 101) carried through construction with very little inconvenience to traffic.

the work included in the third unit, for which bids were received on May 19th, are of a magnitude equaled only by a few of the largest highway contracts.

Grading of this 8½ mile section involves excavation of nearly 1,500,000 cubic yards of material from within the proposed roadway section and constructing an equal volume of embankments.

Construction of base and pavement will involve the use of large quantities of materials including approximately 110,000 tons of imported base material, 32,000 cubic yards of portland cement concrete and 27,000 tons of asphalt concrete. In addition many other items will be required to provide the drainage structures, safety devices and other features to provide safe travel for the heavy use on this important artery of the State Highway System.

The freeway is being constructed initially as four lanes, but it can be widened when warranted by growing traffic demands to a six-lane divided facility.

The new bypass will be of great benefit not only to motorists traveling through the Redwood Empire, who will save several minutes of travel time, but also to residents of Petaluma as well. The Petaluma business district will at long last be relieved of the paralyzing economic effects and the congestion caused by through traffic in the downtown area. Convenient interchanges will be built at each end of the project and at two intermediate points for motorists desiring to stop in Petaluma.

Cost $7,000,000 to Santa Rosa

The construction now under way will extend from south of Petaluma to Denman Flat (near Penngrove), a distance of about six miles. Some grading will also be done for an additional 2½ miles north of Denman Flat, but completion of the project north of Denman Flat will depend upon financing in later years. Future work programmed to follow progressively will complete the freeway to Santa Rosa, a distance of 12 additional miles, at a cost of about $7,000,000. This construction will connect the freeway with the previously completed Santa Rosa Freeway, and thereby provide an uninterrupted multilane divided freeway for a distance of about 52 miles between the Golden Gate Bridge and north of Santa Rosa.

In connection with the realignment between south of Petaluma and Denman Flat, some 17 bridges are required at 11 different points. Some of these structures are parallel bridges, where others are single structures carrying local roads over the freeway. Most of the structures are concrete box girders, although some of the shorter bridges are concrete slab or concrete girder structures. The structures included in order from south to north are the following:

1. South Petaluma Undercrossing (two parallel bridges).
2. Petaluma Creek Bridge and Overhead (two parallel bridges over existing US 101, Northwestern Pacific Railroad, and Petaluma Creek).
3. Lakeville Highway Separation and Overhead (two parallel bridges crossing over state highway and Northwestern Pacific Railroad).
4. Washington Street Overcrossing.
5. Washington Street Creek (two parallel bridges).
6. Washington Street Creek Off-ramp.
7. Lynch Creek (two parallel bridges).
8. North Petaluma Overhead (parallel bridges over Northwestern Pacific Railroad).
9. Corona Road Overcrossing (county road crossing of Petaluma and Santa Rosa Railroad and the freeway).
10. Denman Overcrossing.
11. Willow Brook (two parallel bridges).

Petaluma Creek Bridges

Of particular structural interest are the two parallel and identical Petaluma Creek bridges now being built at a cost of about $850,000 at the southern end of the project. With the exception of the span over the navigation channel, these bridges are reinforced concrete box girders, that is, hollow or cellular. The bridges will be perhaps the highest structures of this type in California, the extreme height being due to the necessity of providing clearance over the Petaluma Creek navigation channel.

Petaluma Creek is classified as one of the navigable waterways of the United States and, therefore, is under the jurisdiction of the U. S. Army Corps of Engineers. At the bridge site the navigation channel is 100 feet wide, with a minimum vertical clearance of 70 feet.

Design of Span

Since falsework construction over the navigation channel was infeasible, this span will be bridged with eight 110-foot-long precast I-shaped reinforced concrete girders which will be

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Highway Projects in District X

Priests Grade

By C. J. TEMBY
Assistant District Engineer

In August, 1953, 3.8 miles of construction between Moccasin Creek Road and Priests in Tuolumne County was completed. This is the upper portion of Priests Grade on the Big Oak Flat Highway. Another 2.8 miles, the lower portion, is included in the 1954-55 Fiscal Year construction program and will be under construction this year.

The Big Oak Flat Highway, State Highway Route 40, State Sign Route 120, extends from a junction with Sonora Pass Highway at Yosemite Junction, about nine miles south of Sonora, to the Yosemite National Park. It traverses an area in which much of the early California history was made. Many rich gold mines were located and operated in this area.

Along the Big Oak Flat Road are located such historical places as Chinese Camp, Jacksonville, Priests, Big Oak Flat and Groveland. The First and Second Garrotte, where many of the early day hangings of horse thieves, cattle rustlers and other criminals took place, east of Groveland. Hangman's Tree still stands at the First Garrotte, just east of Groveland.

Priests Grade, showing curve correction typical of this project

Priests at top of Priests Grade. LOWER LEFT—County road Priests to Moccasin Creek powerhouse. LOWER RIGHT—County road to Coulterville. State highway, left down grade to Yosemite Junction via Jacksonville and Chinese Camp, right to Yosemite National Park via Big Oak Flat and Groveland.

Considerable logging and lumbering has been carried on in this area in recent years. There are several lumber mills presently being operated.

The O'Shaughnessy Dam and Hetch Hetchy Reservoir, City of San Francisco's water supply, is located about 12 miles north of the Big Oak Flat Road at the westerly park boundary.

Cherry Valley Dam, presently under construction, is situated northerly from the Big Oak Flat Road.

Moccasin Creek Power House, seen from Priests Grade, is located below the highway. In this same vicinity is the location of a large fish hatchery.

In addition to providing an entrance to Yosemite National Park, the Big Oak Flat Road serves the recreational areas of southeastern Tuolumne County and northern Mariposa County.

The completed construction on Priests Grade has resulted in providing a 28-foot all-paved roadbed with widening of the curves, making a safe two-lane road. Excess excavation material from grading operations was disposed of on the inside of the several short radii curves by end dump methods. These areas, beyond the traveled way, provided the visual appearance of a much wider facility, resulting in added comfort to the driver traveling this portion of the road.

The old narrow roadbed, particularly on the short radii curves, was unattractive and after one trip, tourists avoided the Big Oak Flat Road. The construction, completed under contract with Paul E. McCollum & C. L. Cypher, at a cost of approximately $350,000, involved 156,300 cubic yards of roadway excavation, 15,300 tons of untreated rock base and 8,000 tons of plant-mixed surfacing. The base and surfacing material was produced locally by the contractor from a source at Stevens Bar, the junction of Moccasin Creek and the Tuol-

Upper portion of Priests Grade. Priests at top of picture. County road, Priests to Moccasin Creek power house on right. Widened state highway up grade on left.

umne River. Mr. A. K. Nulty was the resident engineer for the State.

The lower 2.8 miles proposes a 28-foot all-paved roadbed and some realignment will be made. A new bridge over Moccasin Creek is to be constructed. The proposed construction, consisting of grading, base, surfacing and a new bridge, will be under way this summer. The major items of work will consist of 183,100 cubic yards of roadway excavation, 17,200 tons of untreated rock base and 7,500 tons of plant-mixed surfacing. Unprocessed material for concrete, base and surfacing are available locally within economical hauling distance from the proposed work.

Briceburg Grade

By R. V. POTTER
District Design Engineer

A boon to tourists to famous Yosemite National Park is news of the widening and improvement of steep, winding Briceburg Grade. Sometimes looked-on as a deterrent to reaching the wonders of Yosemite, this grade, averaging 7 percent, extends from Briceburg, in the Merced River Canyon in Mariposa County, westerly to King Solomon Mine, a distance of 2.5 miles. The grade is on a portion of State Highway Route X-Mpa-18-F, better known to campers, vacationers and snow sports enthusiasts as the Yosemite All-year Highway.

Highway locators view Briceburg Grade as a control considering that if the grade were abandoned in favor of other routing, many additional miles of heavy mountain grading work would be required to reach the Merced River Canyon. It, therefore, was decided in the interest of the most beneficial use of highway funds, to improve the investment already made in the existing route. Although the road gradient could not be appreciably relieved, widening roadbed, reducing curvature, flattening precipitous rock slopes and correcting inadequate drainage could be accomplished for the direct benefit of the tourist in safer and more comfortable driving on this recreational route.

Highway designers completed their study for improvement of this grade September of 1953. The primary benefit that could be attained for the motorist under the rigid controls of steep grade and constant curvature was pavement widening. Accordingly a 32-foot wide all-paved section was selected affording a noticable improvement as compared with the existing 20-foot wide road mix gravel pavement.

The existing alignment contained 3,080 degrees of curvature. It was found possible to reduce this curvature over 45 percent without introducing grade steeper than 7 percent.

Fearsome features of the old alignment were towering rock slopes which, to a timid driver, seemed at some locations actually to incline toward the roadway as illustrated in the accompanying photograph. Study showed that these slopes could be flattened to avoid this appearance with a consequent reduction in slides and falling rocks for which Briceburg Grade had to be daily patrolled by the department's maintenance crews.

Being on sidehill section throughout, drainage from the cut side was designed in conventional cross drains with one notable exception. At Station 215 on the grade, Rancheria Creek, a docile trickle down the cut slope during summer and winter months, attains cataract proportions in the spring, actually hurling water and debris on the roadbed shoulder and

UPPER LEFT—Aerial view, showing Briceburg on the Merced River and easterly mile of circuitous Briceburg Grade. Note portion of grade behind mountain at top of photo. UPPER RIGHT—Typical cut slope on Briceburg Grade showing up-ended rock strata inclining toward roadway. LOWER—Power shovel at work on Briceburg Grade.

pavement at times of flood crest. Means taken to correct this condition consisted in moving the roadbed out into the canyon on a local line change, installing an 84-inch diameter extra-reinforced concrete pipe cross drain and providing a grouted riprap-lined entrance channel 300 feet long and 5 feet deep with debris rack at entrance. The bid price on installing the concrete pipe cross-drain at this location was $100 per lineal foot.

This improvement project was advertised in November of 1953. The low bid was submitted by Harms Brothers of Sacramento in the amount of $570,614, the price bid for roadway excavation being $2.50 a cubic yard which figure is indicative of the heavy rock grading work involved.

The road is presently under construction. Paving operations are now under way and the project is scheduled for completion late in the summer of 1954.

Mel Rowan is resident engineer for the State.

Yosemite Highway

By C. E. MOFFATT
Assistant District Design Engineer

CONSTRUCTION is under way for an additional three-mile improvement of a portion of Route 18 (State Sign Route 140) in Mariposa County between 9.3 miles west and 6.3 miles west of the town of Mariposa.

Route 18 runs from Merced, through Mariposa, and traverses the Merced River Canyon to Yosemite National Park and is known locally as the Yosemite All-year Highway. It is the major access route to Mariposa County and is one of the major routes into Yosemite National Park

The road serves not only tourists and vacationists, but timbermen, cattle raisers and miners. Half a million tourists visit the valley and other resorts and camping grounds yearly in all seasons.

This section was incorporated in the State Highway System under the Legislative Act of 1909 and the present route was adopted by the California Highway Commission on May 22, 1930.

Mariposa, at 6½ miles east of the project, is the County Seat of Mariposa County and has a population of around 1,000. It is an historic gold rush town with many old buildings, including the oldest active courthouse in the State.

The current project traverses a portion of the lower slopes of the Sierra Nevada Mountains, at an elevation of 1,885 feet above sea level at the westerly end rising to elevation 2,320 at 1 1/3 miles, thence descending to elevation 2,120 at the easterly end. The terrain is rather rugged and timbered with brush, conifers and live oaks.

The present alignment contains a number of sharp curves and in several locations the intervening tangent distance is substandard. Sight distance is restricted by steep cut banks on the inside of short radii horizontal curves and by numerous vertical curves.

The existing roadbed varies in width from 24 feet to 26 feet with surfacing of oiled gravel 20 feet wide by 8 inches thick. The shoulders are untreated.

The improvement consists of new alignment for one-half mile at the westerly end and widening and resurfacing along the existing alignment for the remainder of the project.

On the new alignment and at several locations on the portion to be resurfaced, the cuts will be made on 1:1 slope. The geologic formation is predominantly clays, shale and slate, with granitic intrusions at a number of locations. Existing cut slopes generally stand on 1:1.

The typical section will consist of a 28-foot all-paved section with central 24 feet being 2½ inches thick and the shoulders two feet wide, the surfacing tapering to 1½ inches at the outer edges. The traffic lanes, shoulders, dikes and gutters will be paved with plant-mixed surfacing. The base will be six inches of untreated rock over five inches of imported subbase material for the new alignment and for the widening on existing alignment.

Some of the principal contract items are as follows:

29,700 cubic yards roadway excavation.
1,220 cubic yards ditch and channel excavation.

LEFT—Drilling for blasting on portions to be realigned. RIGHT—Portion of existing road to be widened and resurfaced. No change in alignment to be made.

1,690 tons imported subbase material.
14,500 tons untreated rock base.
9,600 tons mineral aggregate (plant-mixed surfacing).
2,350 linear feet metal plate guard railing.
4,500 linear feet new property fence.

Construction began on April 4, 1954, and it is anticipated that the project will be completed in the fall of 1954. The contract specifies that traffic shall be taken through the construction area, no detour being available.

The current project, together with the improvement of the Briceburg Grade to be completed in late summer of 1954, and several other completed projects have improved this route greatly during the last few years.

The work, costing approximately $215,000, is being done by the Granite Construction Company of Watsonville, California. Fred L. Smith is the Resident Engineer for the Division of Highways on the project.

Bids have been received for an additional project approximately four miles long through the City of Merced and west of Planada on this same road, and other projects are planned for construction as funds become available.

Looking southeast toward town of Mariposa in distance. Photo taken before beginning of surfacing in spring of 1954.

Mother Lode

By C. E. MOFFATT
Assistant District Design Engineer

Construction will be completed soon of a two-mile improvement of a portion of Route 65 (State Sign Route 49) from the town of Mariposa northerly toward Mt. Bullion, Coulterville and Sonora.

A part of Route 49 is known as the Mother Lode Highway and extends from Auburn on the north, through the early gold mining region to Mariposa in the south. This area is rich in history of California's earlier days and attracts a considerable number of tourists each year.

The portion of Sign Route 49 from Sign Route 120 where it crosses the Tuolumne River at Moccasin Creek to Mariposa was incorporated in the State Highway System by Legislative Act of 1933 along with several miles of other county roads in District X. Most of these roads, particularly in the mountainous areas, were deficient in several respects according to recognized minimum standards. Improvements have been made as fast as funds have become available, and this program has been accelerated as a result of the increase in gas tax.

The current project traverses a region of moderate size mountains, covered with grass, brush and scattered trees, and lies at an elevation of 2,040 feet to 2,440 feet. The road prior to the present work, was on sidehill alignment generally and followed the contour of the ground with the minimum of cut and fill. It included many short radius horizontal curves and short vertical curves, with sight distance restrictions at several locations. The surface was oil treated native material from one inch to three inches thick, averaging 16 feet in width.

The improvement consists of grading and paving on improved alignment and grade along the general location of the existing road. Improved drainage facilities were included in the design. On roads in this area, available funds are limited, and the alignment was therefore very carefully designed to obtain the most economical location.

A very good alignment was obtained, however, and the first mile out of Mariposa is excellent. For the second mile it was necessary to rise 340 feet, the average grade being 6½ percent. Both horizontal and vertical alignment, however, is very good for this type of terrain and for the moderate traffic volumes to be expected.

The typical cross-section consists of plant-mixed surfacing 2 inches thick and 24 feet wide over 4 inches of untreated rock base on imported subbase material varying from 4 inches to 10

Typical alignment on new construction. Plant-mixed surfacing has not been placed.

inches thick. Shoulders are untreated rock base two feet wide with Class "C" medium seal coat.

The top soil formation is a thin layer derived from the weathering of the underlying volcanic and sedimentary rock. Cut slopes were designed on a 1:1 slope.

Contract items included the following:

- 47,000 cubic yards roadway excavation.
- 1,660 cubic yards ditch and channel excavation.
- 10,200 tons imported subbase material.
- 9,900 tons untreated rock base.
- 3,500 tons mineral aggregate (plant-mixed surfacing).
- 107 cubic yards Class "A" portland cement concrete (structures).
- 24 tons corrugated metal pipe of various sizes.

Construction began on August 10, 1953, and proceeded until December 23, 1953, when it became necessary to shut down for the winter. At that time the earthwork had been completed, the subbase and base had been placed and the drainage works completed. Paving and performing of minor items of the contract is expected to be completed July 1, 1954.

No unusual problems have been encountered during construction. Traffic has been passed through the construction are without appreciable delay.

Total cost of the project will be approximately $221,000, of which nearly one-half is F. A. S. funds, and the remainder, state highway funds.

The Board of Supervisors of Mariposa County has cooperated with the Division of Highways in selecting the portion to be improved and in allocating county F. A. S. funds to cover a portion of the cost.

The project is being constructed by the Close Building Supply Co. of Hayward, California. W. L. Creger is the resident engineer for the Division of Highways on the project.

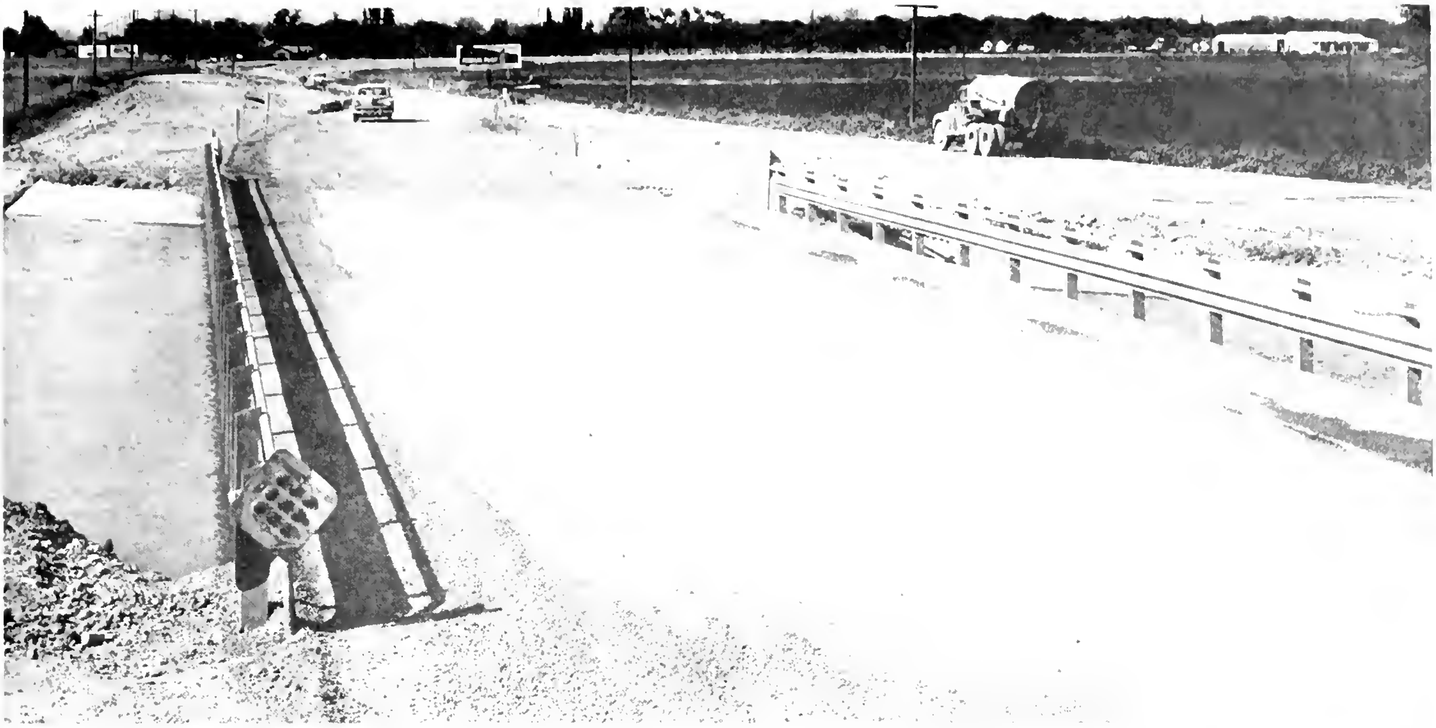
South of Gustine

By R. K. WELLS
Highway Engineering Associate

WITH THE completion of a realignment project south of Gustine early this June one of the worst physical hazards on State Sign Route 33, the Westside Highway, will have been eliminated. The proposed work will replace an existing bridge and eliminate a "T" intersection.

The existing bridge, constructed in 1920 by Merced County, was 115 feet long and 21 feet wide. The bridge itself was on tangent with a skew of approximately 45 degrees, but the approaches were on 400-foot radius reversing curves. The combination of short approach curves, abrupt skew, and solid concrete railing created a traffic hazard of the first magnitude.

Less than one-half mile north of the bridge the highway turned east at a "T" intersection. This intersection had been widened on the inside until it



UPPER—View of project south of Gustine, looking north toward Borelli's Corner, showing new bridge with new alignment curving to right. CENTER—Bridge at Gustine Canal. View looking westerly showing bank lining. LOWER—View of project south of Gustine looking south, showing new alignment at south connection.

provided a return radius of less than 100 feet.

The present contract, awarded to M. J. Ruddy & Son on November 19, 1953, provides for a new bridge west of old structure, and elimination of the "T" intersection at "Borelli's Corner" at the approximate cost of $132,000.

The new bridge provides a clear width of 32 feet, with tangent approaches and ample sight distance, and the former "T" intersection has been replaced with a minimum 1,200-foot radius curve with the roadway built to modern standards.

Under the able supervision of Resident Engineer Herman Jantzen, this apparently simple, but actually complicated project, has been successfully integrated. In order to provide for traffic the existing road was used while the new channel, bridge and approaches were constructed. When completed, traffic was switched to new construction, the old bridge removed, the balance of the canal constructed, and the outside canal bank concrete lined. Since all work at the canal had to be completed between irrigation seasons a construction program had to be set up and strictly adhered to. The fact that no delays were occasioned, either to vehicular traffic or the flow of water, bears testimony to the excellence of the manner in which the work was handled.

View of project looking west from near Gurr Road

Gustine to Merced Highway

By R. K. WELLS
Highway Engineering Associate

On October 16, 1953, M. J. Reddy & Son was awarded a contract in the amount of $300,000 for improving portions of State Sign Route 140, between Gustine and Merced. This route is entirely rural and serves a rich dairy and truck garden area.

The original road was constructed by a number of road districts and consisted, in general, of a 16-foot oiled earth traveled way with earth shoulders.

Incorporated into the State Highway System on September 3, 1937, this route has been constantly improved by state forces and contracts; the magnitude of these improvements being reflected in an average cost of $2,000 per mile per year for maintenance.

The 3.9-mile portions that are now being improved are those that are subject to annual inundation during the

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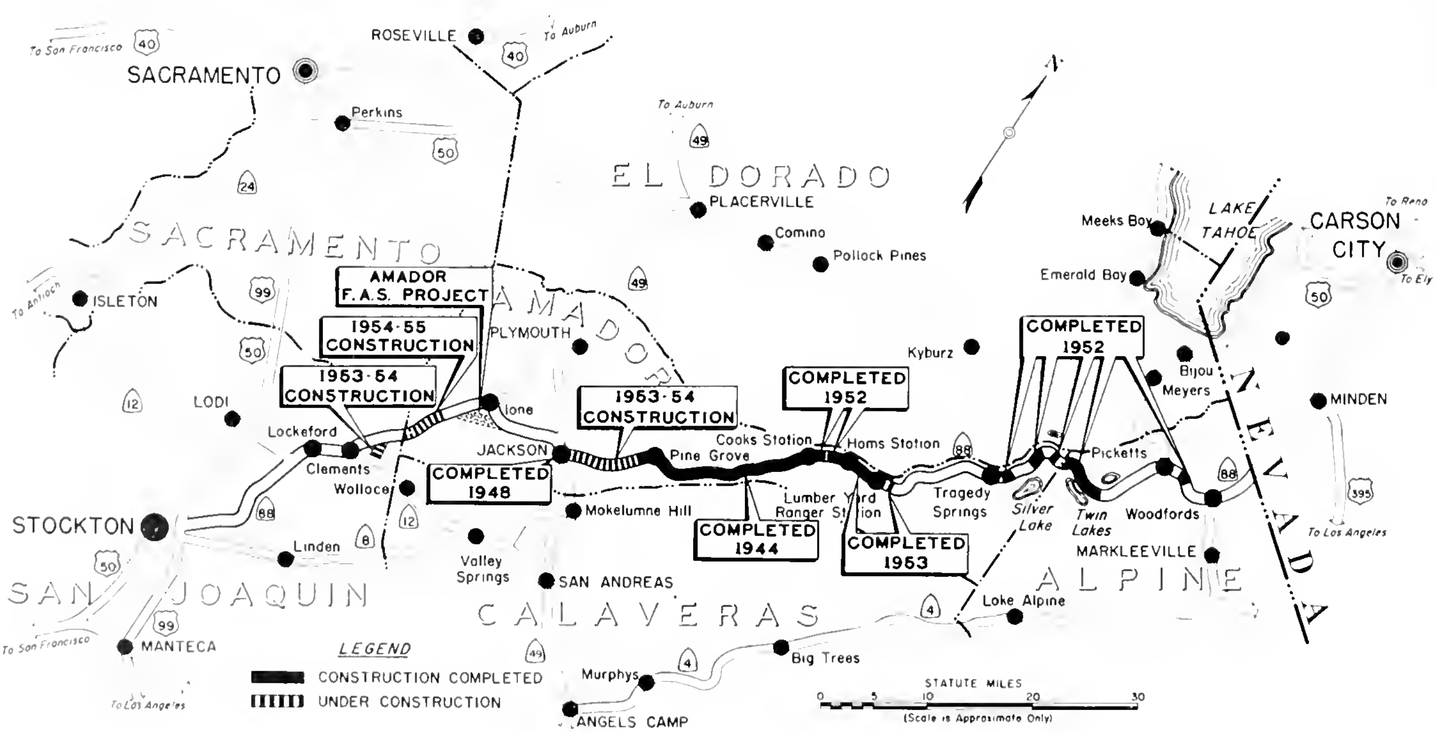
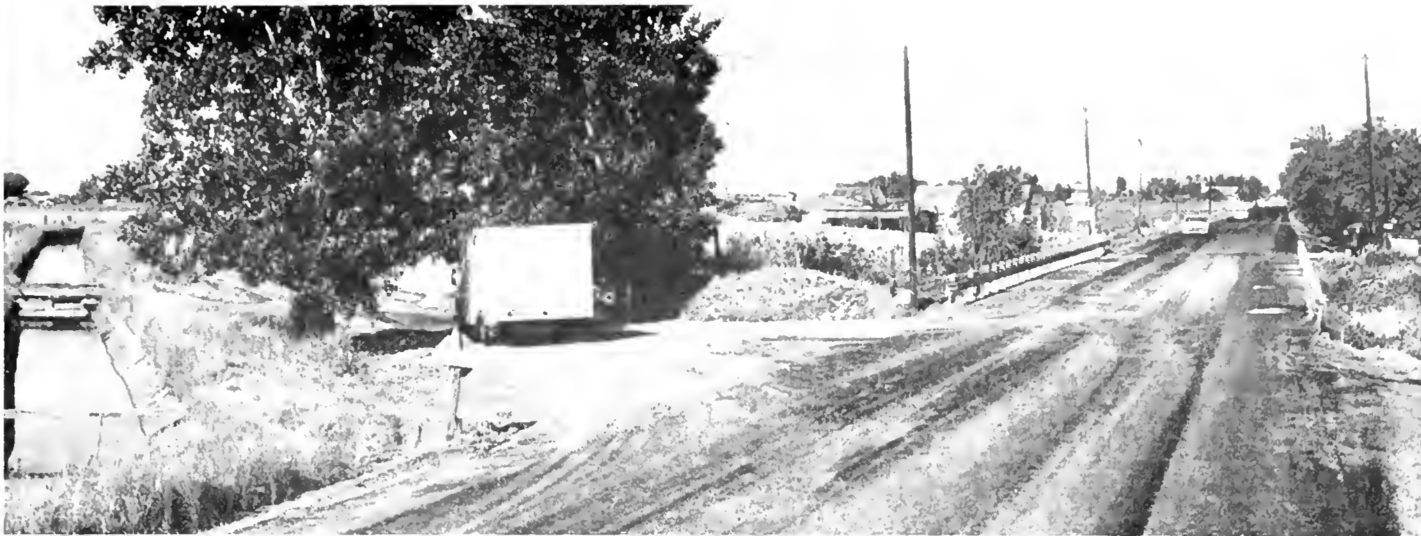
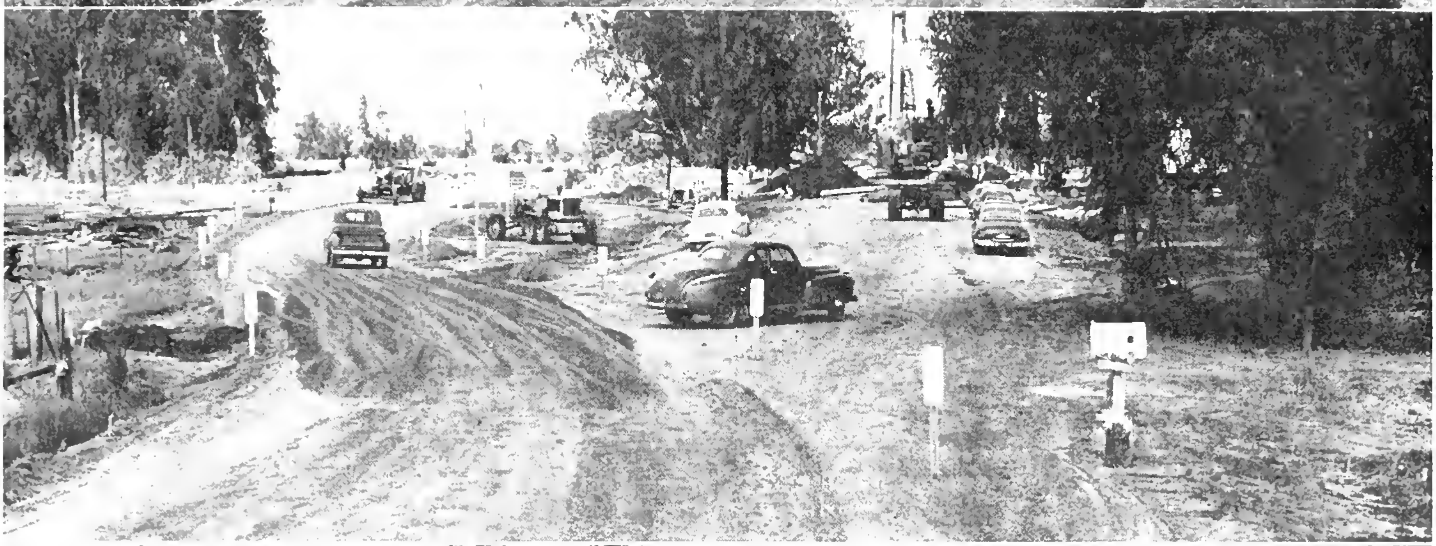
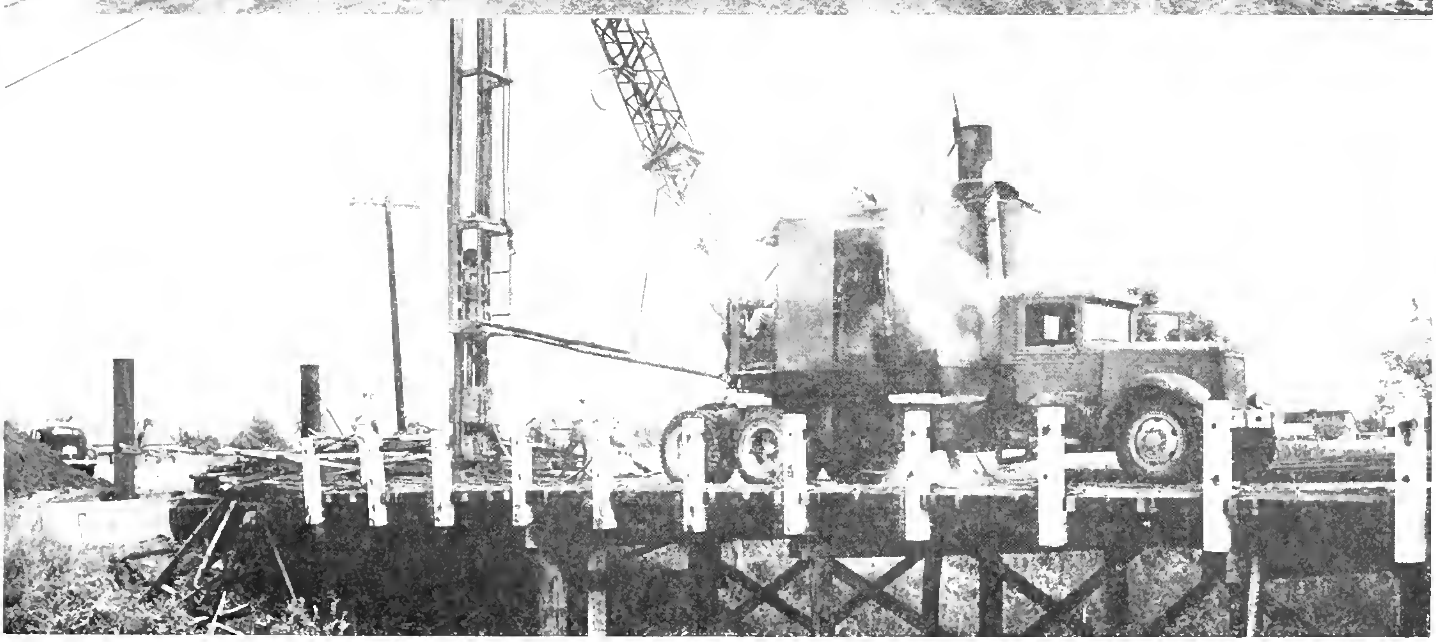








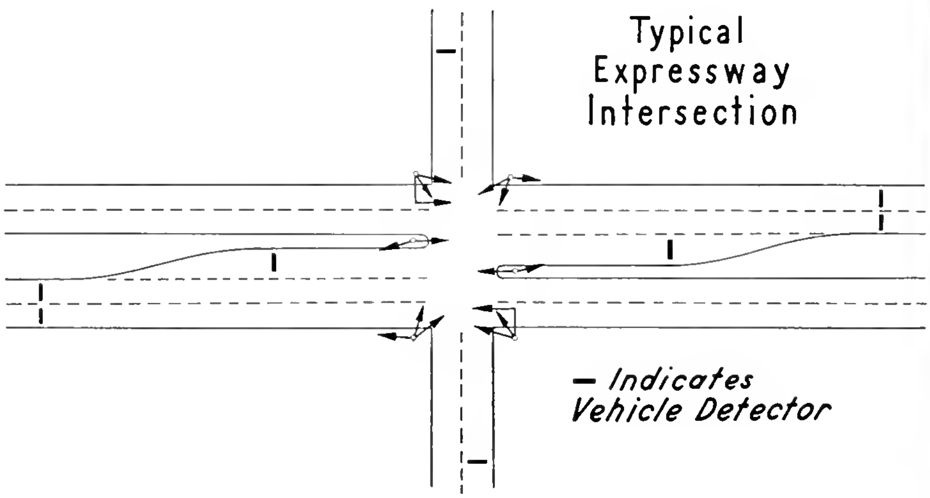
UPPER—View of project looking west from near west end of second portion. CENTER—View of old bridge and detour at Bear Creek. LOWER—View of old bridge at Bear Creek.

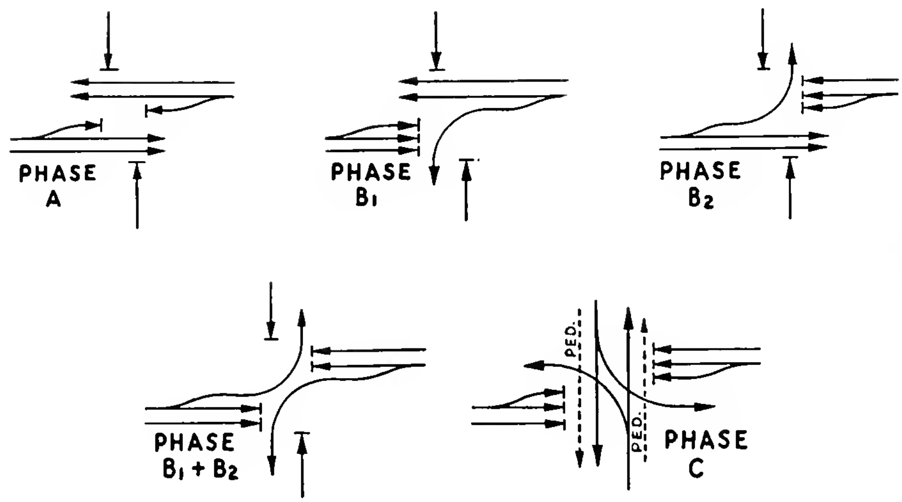
USE OF THREE-PHASE TRAFFIC-ACTUATED SIGNALS

By G. M. WEBB, Traffic Engineer, Division of Highways *

The primary reason for installing traffic signals is to facilitate the movement of traffic, and to do this in a safe manner. The installation of signals without justification, or the installation of a signal system which has not been designed for a particular location may result in an increase in accidents.

There are many locations on the State Highway System in California which have had traffic volumes to warrant a grade separation for many years, but because the demand for highway improvements far exceeded available funds, we have been unable to provide the necessary grade separation structures. At such locations, traffic signals are operating with exceedingly high volumes. Capacity and accidents are the problems at these intersections.





Left-turn Movements

One phase of the accident problem is that of accidents involving left-turn movements. With the usual two-phase signal, the motorist desiring to make a left turn from a major highway must pick a gap in the fast-moving opposing through traffic. During this time, he is in a position which may result in a fast-moving through vehicle running into the rear of his car. In addition, while he is waiting he is reducing the capacity of the intersection. Because of this, it has been found necessary to provide a left-turn median lane for this motorist. This reduces his likelihood of having a rear-end type of collision, but does not affect his problem of picking a gap in the opposing through traffic. If he takes a chance and does not make it, the result is often a serious accident. In order to reduce this potential accident hazard, we are finding that it is frequently desirable to provide three-phase signals with a separate phase for left-turn movements especially on rural, high-speed highways. We have found that the replacement of two-phase signals with three-phase signals has reduced accidents involving left-turn vehicles.

* *This paper was presented by Traffic Engineer Webb at a session entitled "What's New in the West?" during the seventh annual combined meeting of the Western Section of the Institute of Traffic Engineers and the Northwest Traffic Engineering Conference, May 12-14, 1954, at Corvallis, Oregon.*

Three-phase Signals

On ordinary city street intersections, three-phase signals are not usually installed unless the left-turn movement is quite large, that is, 10 to 15 percent of the entering traffic. On rural expressways, however, because of the potential left-turn accident hazard, we now find it desirable to provide three-phase signals with a separate phase for left-turn movements of comparatively low magnitude.

The main objection to three-phase signals is the additional delay caused by the third phase. To hold this delay to the minimum, we are now using a system known as the "double split-phase." In this system, there are five different arrangements of the signal indications.

In condition No. 1 we have the usual "A" phase for both the through movements. In condition No. 2 we have a "B_1" phase in which vehicles are permitted to go in one of the two left-turn median lanes. The through movement in the same direction as the left-turn movement is also permitted to pass through the intersection since there are no other movements in conflict with it. Similarly, in condition No. 3 we have a "B_2" phase which provides the same operation only in the opposite direction. When vehicles appear in both left-turn lanes, we have condition No. 4 which is a straight left-turn or "B" phase. Condition No. 5 is the "C" phase for the cross-street movement. This "double split-phase" system provides the minimum delay to the through highway traffic, and is especially useful where there are heavy directional peak hours in either the through traffic or the left-turn traffic.

Another recent development in three-phase signals is the three-phase partially traffic-actuated signal system for use in coordinated systems.

Traffic-actuated Signals

We have several locations where it was necessary to install a group of three-phase signals at such spacings that required coordination to provide a progression for the through traffic. At the same time, since there was a considerable variation in traffic during the day in both direction and volume, it was desired that these devices be traffic actuated. In some cases, the spacing of the signals would not permit an ideal progression in both directions at the same time. Recreational traffic on week ends attained a high volume on Friday afternoon in the outbound direction and on Sunday night in the inbound direction. The exact time and length of these peaks cannot be predetermined.

For such requirements, the three-phase partially traffic-actuated signal system is installed. The signal controllers are coordinated by interconnection to a master controller which contains cycle selection equipment. The cycle length and appropriate offsets are selected by the master equipment so that a progressive band is provided on the highway in the direction of the major movement. Sampling detectors are provided in the through-traffic lanes in both directions to provide the necessary information to the master equipment for proper selection of cycle length and direction of the offsets.

Use of Detectors

No detectors are placed in the through-traffic lanes at the individual intersections. The detectors are placed only in the left-turn lanes and on the cross-street approaches.

Consider an example with 50 percent of the cycle length available for the through traffic and 50 percent for the left turn plus cross traffic. Thus with a 100-second cycle operating, and with saturated conditions on the left-turn lanes and cross street, there will be 50 seconds available for the through traffic, 25 seconds for the left turn, and 25 seconds for the cross-street traffic. If either the left turn or cross street does not require the entire time, the remainder of the time can be added to the other movement. If there is neither left-turn nor cross-street traffic, the green will remain on the highway. Then when vehicles do appear in the left-turn lane or the cross-street approaches, they will obtain a green indication only during a "permissive period," which will not interfere with the major highway progression.

District X Highway Projects

Continued from page 48 . . .

spring run-off period. It was the heavy losses in perishable dairy products, caused by producers being unable to deliver their products during flood stages, that dictated both the present improvements and the portions to be improved.

The new construction provides a 24-foot plant-mixed traveled way with four-foot tapered shoulders. The maximum slopes are 2:1. In addition, two reinforced concrete bridges are being widened, and one new reinforced concrete bridge is being constructed.

Work will be done by July of this year. The major contract items are: 75,000 cubic yards imported borrow, 29,300 tons untreated rock base, and 12,400 tons plant-mixed surfacing.

Mr. Herman Jantzen is the Resident Engineer.

Freeway Benefits

Continued from page 33 . . .

indicate travel preference on the freeway over use of existing streets.

The caption "Another Freeway for Your Safety," often seen by motorists on signs at locations where freeways are under construction, is no idle claim for the Carlsbad-Oceanside Freeway. The former state highway, replaced by the freeway in these two cities, had an unfavorable accident record. In 1952, 561 accidents resulting in 13 fatalities occurred on the former route. This number of accidents averages 47 per month. During the five-month period the new freeway had been opened to traffic, an average number of 22 accidents per month, totaling 108 accidents, occurred on the former state highway and on the new freeway. During a comparable five-month period in 1952, the average number of accidents per month on the former state highway was 45. Thus, a reduction of more than 50 percent in number of accidents has been the result of the freeway construction. This reduction occurred notwithstanding an increase in traffic volumes from 1952 to 1954. The freeway itself, although carrying 63 percent of the total traffic volume on both routes, was the scene of only 40 percent of the 22 accidents, which is equivalent to only 20 percent of the 45 accidents which occurred in the comparable prefreeway period. While the five-month base period is rather short, it is indicative of the reduction in the number of accidents which may be expected by reason of the freeway construction. This good record is somewhat marred by one fatal single vehicle accident which occurred recently. A vehicle, driven by a teenage driver, went out of control, skidded and rolled, killing one of the occupants.

Traffic volumes on the new freeway compare closely with the traffic estimates made prior to its construction and all interchanges appear to handle traffic efficiently and safely. This freeway, together with others on US 101 completed in Orange and Los Angeles Counties, has considerably reduced travel time for many users between San Diego and the Los Angeles area.

Cost Index

State Highway Construction Costs Drop During First Quarter 1954

RICHARD H. WILSON, Assistant State Highway Engineer
H. C. McCARTY, Office Engineer
JOHN D. GALLAGHER, Assistant Office Engineer

As indicated by the California Highway Construction Cost Index, contract prices on state highway construction projects were 8.0 percent lower in the first quarter of 1954 than during the fourth quarter of 1953.

The Index for this first quarter stood at 199.4 (1940 = 100) which was a drop of 17.3 points, below the last quarter of 1953. This is the first time in four years that the California Index has been below 215. In the fourth quarter of 1950 it was 194.8.

The accompanying tabulation shows the California Highway Construction Cost Index by years from 1940 to 1949 and by quarters from 1950 to the first quarter of 1954.

THE CALIFORNIA HIGHWAY CONSTRUCTION COST INDEX

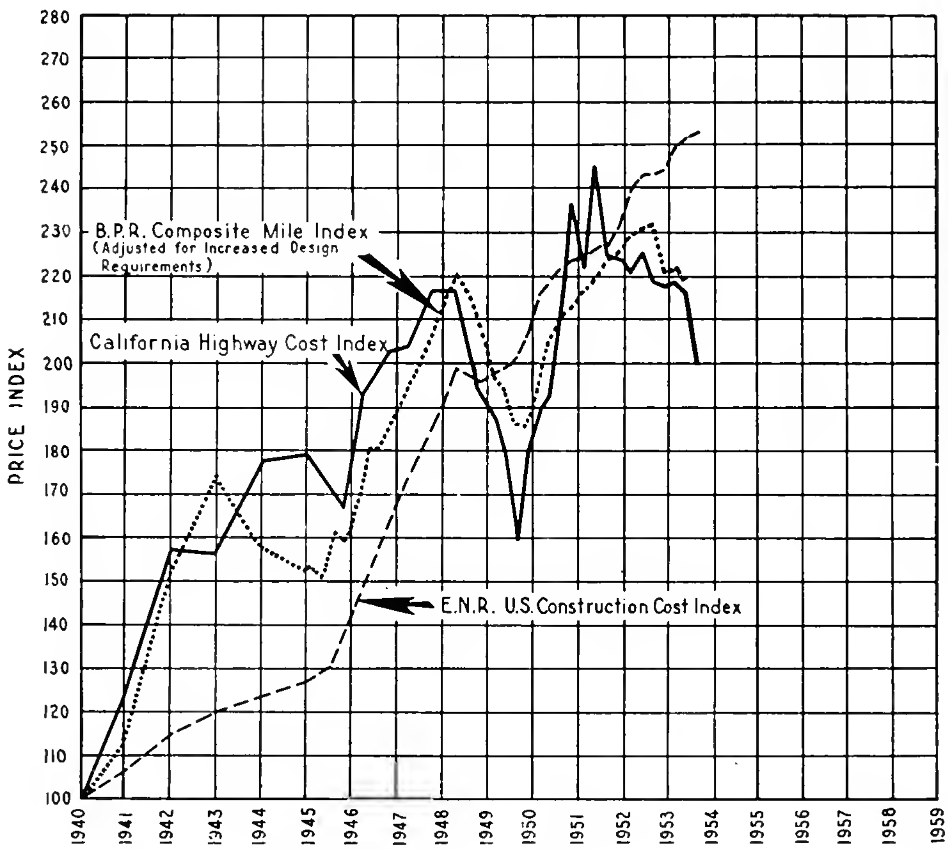
Year	*Cost index*
1940	100.0
1941	125.0
1942	157.5
1943	156.4
1944	177.8
1945	179.5
1946	179.7
1947	203.3
1948	216.6
1949	190.7
1950 (1st quarter)	160.6
1950 (2d quarter)	180.0
1950 (3d quarter)	189.2
1950 (4th quarter)	194.8
1951 (1st quarter)	215.4
1951 (2d quarter)	238.3
1951 (3d quarter)	221.9
1951 (4th quarter)	245.4
1952 (1st quarter)	224.8
1952 (2d quarter)	224.4
1952 (3d quarter)	221.2
1952 (4th quarter)	226.2
1953 (1st quarter)	218.3
1953 (2d quarter)	217.5
1953 (3d quarter)	218.0
1953 (4th quarter)	216.7
1954 (1st quarter)	199.4

During 1953 the Index was practically stationary, the first quarter being 218.3, the second 217.5, the third 218.0 and the fourth quarter 216.7. Then with the first quarter of 1954 comes this 8.0 percent drop to 194.8.

The drop is not a surprise, it almost could be seen coming in the steady increase in competition among bidders. The California Division of Highways awarded 466 highway and bridge contracts with a value of $101,900,000 during the calendar year of 1953. For bids opened during the month of January, 1953, the average number of bidders was 5.5; by June, 1953, the average was up to 6.0 bidders per project; in July it was 6.2; August, 6.9; September, 6.4; October, 7.6; November, 7.4; and December, 7.6. During this steady rise in the average number of bidders highway construction costs as reflected by the Index were hovering about on a level. During the first quarter of 1954, the Division of High-

PRICE INDEX CONSTRUCTION COSTS

1940 = 100



FISCAL YEARS
(July 1 to June 30)

CALIFORNIA DIVISION OF HIGHWAYS AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Crusher run base, per ton	Plant-mix surfacing, per ton	Asphalt concrete pavement, per ton	PCC pavement, per cu. yd.	PCC structures, per cu. yd.	Bar-reinforcing steel, per lb.	Structural steel, per lb.
1940	$0.22	$1.54	$2.19	$2.97	$7.68	$ 18.33	$0.040	$0.083
1941	0.26	2.31	2.84	3.18	7.54	23.31	0.053	0.107
1942	0.35	2.81	4.02	4.16	9.62	29.48	0.073	0.103
1943	0.42	2.26	3.71	4.76	11.48	31.76	0.059	0.080
1944	0.50	2.45	4.10	4.50	10.46	31.99	0.054	0.132
1945	0.51	2.42	4.20	4.88	10.90	37.20	0.059	0.102
1946	0.41	2.45	4.00	4.68	9.48	37.38	0.060	0.099
1947	0.46	2.42	4.32	5.38	12.38	48.44	0.080	0.138
1948	0.55	2.43	4.30	5.38	13.04	49.86	0.092	0.126
1949	0.49	2.67	4.67	4.64	12.28	48.67	0.096	0.117
1st quarter 1950	0.34	2.22	3.65	3.74		40.15	0.077	0.081
2d quarter 1950	0.40	2.13	4.48	3.74	10.86	43.03	0.080	0.105
3d quarter 1950	0.41	2.32	4.25	5.50	10.91	44.34	0.093	0.131
4th quarter 1950	0.42	2.81	4.64	4.61	12.55	43.18	0.098	0.120
1st quarter 1951	0.45	3.07	4.06	5.22	11.71	46.38	0.103	0.206
2d quarter 1951	0.63	3.88	4.56	4.63	12.93	51.50	0.105	0.166
3d quarter 1951	0.56	2.88	4.59	3.90	12.41	46.14	0.107	0.165
4th quarter 1951	0.66	2.91	5.66	4.89	12.71	49.38	0.105	0.169
1st quarter 1952	0.56	3.25	4.88	4.77	14.25	47.46	0.094	0.152
2d quarter 1952	0.53	3.19	5.29	4.13	14.20	49.12	0.091	0.143
3d quarter 1952	0.55	2.61	5.49	4.60	12.80	48.21	0.094	0.132
4th quarter 1952	0.66	2.68	4.97		12.53	48.45	0.094	0.128
1st quarter 1953	0.45	2.48*	5.27	4.46	12.47	53.19	0.098	0.150
2d quarter 1953	0.50	2.07	5.38	4.59	13.06	52.68	0.091	0.132
3d quarter 1953	0.54	2.15	5.30	4.82	13.78	49.23	0.092	0.129
4th quarter 1953	0.48	2.11	4.74	4.47	14.77	53.41	0.105	0.139
1st quarter 1954	0.45	2.28	4.23	4.78	14.89	47.52	0.092	0.126

* Untreated rock base substituted for crusher run base at this point.

ways opened bids for 119 contracts, with a construction value of $27,200,000, and the average number of bidders for the quarter rose to 8.5 per project, while construction costs dropped 8.0 percent. The accompanying tabulation for the first quarter of 1954 lists the number and size of projects, with total bid values and number of bidders on state highway work.

The level of construction costs during 1953 was maintained in the face of increases in labor costs resulting from continued demands of labor for higher wages and increased fringe benefits. The drop in bid prices and the jump in the average number of bidders during the first three months of 1954 is further indication of an increasing hunger on the part of contractors for construction jobs.

One factor affecting this is the reduction in federal construction. The upsurge in the number of bidders on state highway projects also would in-

NUMBER AND SIZE OF PROJECTS, TOTAL BID VALUES AND AVERAGE NUMBER OF BIDDERS

(January 1, 1954, to March 31, 1954—First Quarter 1954)

Project volume	Up to $50,000	$50,000 to $100,000	$100,000 to $250,000	$250,000 to $500,000	$500,000 to $1,000,000	Over $1,000,000	All projects
Road projects:							
No. of projects	51	19	16	7	9	1	103
Total value (bid items)	$1,053,796	$1,350,224	$2,638,093	$2,285,183	$6,376,937	$1,544,688	$15,248,915
Avg. no. bidders	6.7	7.7	11.1	9.0	10.6	17.0	8.1
Structure projects:							
No. of projects	8	2		2		1	13
Total value (bid items)	$203,311	$116,674		$560,581		$4,194,462	$5,075,028
Avg. no. bidders	9.1	11.5		14.0		11.0	10.2
Combination projects:							
No. of projects						3	3
Total value (bid items)						$6,892,918	$6,892,918
Avg. no. bidders						12.7	12.7
Summary:							
No. of projects	59	21	16	9	9	5	119
Total value (bid items)	$1,257,107	$1,466,898	$2,638,093	$2,845,764	$6,376,931	$12,632,068	$27,216,861
Avg. no. bidders	7.0	8.0	11.1	10.0	10.6	13.2	8.5

Total Average Bidders by Months

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1954	7.6	11.2	7.2										8.5 (1st quarter)
1953	5.5	6.1	7.5	6.4	5.9	6.0	6.2	6.9	6.4	7.6	7.4	7.7	6.7

dicate a falling off of new work in other branches of construction.

Contractors with experienced and well integrated organizations wish to keep them intact; to do so requires continued income and to keep the pay estimates coming in contractors reduce their bid prices. Many have heavy equipment obligations which must be met regularly and going work is necessary to provide the funds to meet such obligations, so bid prices are cut in the effort to be low bidder.

Another item which it is thought continues to be an influence in lowering bid prices is the availability of materials and equipment. Bidders over a period of some years have included various factors in their bid prices to cover delays or premiums in securing materials and equipment. With production near an all time high, such factors become unnecessary and their discard is reflected in lower prices.

The accompanying tabulation of average contract unit prices for the eight items on which the California Highway Construction Cost Index is based shows these average unit prices by years and quarters since 1940. From this tabulation it will be noted that for the first quarter of 1954 roadway excavation dropped 6.25 percent, from $0.48 to $0.45 per cubic yard; plant mixed surfacing went down 10.8 percent, from $4.74 to $4.23 per ton; portland cement concrete, structures, was down 11.0 percent from $53.41 to $47.52 per cubic yard; the average unit price for bar reinforcing steel dropped 12.4 percent from $0.105 to $0.092 per pound and structural steel was down from $0.139 to $0.126 per pound, a drop of 9.4 percent. Three of the eight items showed an increase in average unit prices; untreated rock base was up $0.17 per ton, a rise of 8.1 percent; asphalt concrete pavement rose $0.31 or 6.9 percent per ton and portland cement concrete pavement was up from $14.77 to $14.89 per cubic yard, which is 0.8 percent.

While the average unit prices on five of the eight basic items dropped materially during the first quarter of 1954 it is interesting to note that the average unit price of portland cement concrete pavement which rose slightly reached its highest price since 1940 and structure concrete had reached its highest price during the previous quarter.

The accompanying chart compares the California Highway Construction Cost Index with the U. S. Bureau of Public Roads Composite Mile Index and the Engineering News-Record Construction Cost Index, all reduced to the base of 1940 = 100.

In view of the continuing increase in competition it is the opinion of this department that the 8.0 percent drop in California Index during the first quarter of 1954 marks a definite break in the high construction costs. As long as general production remains at high levels and materials and equipment are readily available continued lower costs may be expected, barring international developments which might result in large scale federal construction operations and a return to federal control of materials.

How Do We Blueprint?

Continued from page 19 . . .

expanding economy and increasing population. Becoming aware of this, as I have indicated they must, organized highway users, business and industrial leaders and other interested groups, acting through our State Chamber of Commerce, undertook to do something about it in 1943. This led to a state-wide conference of representatives of leading civic organizations and official bodies particularly concerned with the adequacy of highways. (The circles in our pool were widening.)

Drive for Highway Program

Out of this conference came the Major Highway Development Committee. This group spearheaded the drive for a highway program, but I do not mean to imply that other groups were idle. Although legislation was introduced in 1945, it failed of passage. We weren't quite ready. All the lines of the blueprint had not been completely developed into a workable plan. Although there was growing public awareness, it had not yet reached the Legislature with sufficient clarity. A critical step was taken by the Legislature in 1945, however. That was the formation of the Joint Fact-Finding Committee on Highways, Streets and Bridges. Here was the legislative participation so essential to the blueprint. To the lasting credit of this committee, they made the most comprehensive and painstaking study ever accomplished by a legislative interim committee in California. Some 60 meetings were held in every part of the State. Prominent engineers and tax consultants were engaged. California's highway system, the financing of highways and our present as well as future needs were subjected to the most searching studies and evaluations. Detailed reports were subsequently submitted to the entire Legislature.

Public Interest

During this interim period, the increase in public interest was best evidenced by an enlargement of the Major Highway Development Committee. Truck organizations, the oil industry, local chambers of commerce, railroads, merchant organizations as well as city and county government representatives were all brought into participation. The momentum gained during the period between sessions, 1945 to 1947, impelled Governor Earl Warren to call a special session of our Legislature to run concurrently with the regular session of 1947.

Time, of course, does not permit going into the trials and tribulations which all of us in any way connected with the matter went through. Suffice to say fuel taxes were increased from 3 cents to 4½ cents; registration fees went from $3 to $6; weight fees were increased substantially; and allocations to cities and counties for their streets and roads were materially increased. Substantive changes were also made in administrative provisions of the law.

Spiraling Costs

We thought at that time that we were making an attack upon a $1,674,000,000 problem with something just over one billion dollars over a 15-year period. However, as a result of spiraling costs the highway construction dollar fell far below the value anticipated. This, coupled with an increase in population and motor vehicle registration far beyond the wildest predictions and best estimates of 1946 and 1947, soon led to the inescapable fact that we were falling behind faster than at any period in our history. Where we had anticipated getting $5 worth of construction, we were getting only $4. Where in 1946 it was estimated, and the Legislature based its action on these figures, that the population of our State would reach 11,100,000 by 1960, we passed the 12,000,000 mark in late 1953. Where the best forecasts in 1946 told us that we could anticipate 5,250,000 vehicles by 1960, we passed 6,000,000 just at the end of last year, 1953.

As a result of all this, we found that by 1952 we had critical deficiencies amounting to $3,314,000,000 where in 1947 they had been estimated at $1,674,000,000.

Redoubled Efforts

As early as late 1949 and early 1950 the user groups were becoming aware of the inadequacy of the 1947 program. With the blueprint already prepared and proven, it was not difficult to get a new movement under way. At about this time, the California Highway Users Conference was organized and joined the ranks of those in favor of an accelerated program. The Legislature was receptive; in fact some individual Members of the Legislature were the first to sound the alert. The user groups were again ready and the public was well oriented.

The Major Highway Development Committee was reactivated. They went back to the Legislature in 1952. Upon their request a resolution was introduced and adopted setting up another joint interim committee. Also in 1952, the California Highway Users Conference formed a highway committee and, thereafter, the conference worked closely with all user groups in full support of an accelerated program. In passing, it is interesting to note that a large citizens committee was appointed to act in an advisory capacity to the legislative interim committee. Although not too successful when measured by its accomplishments, such a device to broaden participation in the formulation of a highway program should be given serious consideration by anyone who is drawing a blueprint for adequate roads.

1953 Legislation

It is enough to say that the legislative committee again hired outside talent. The Automotive Safety Foundation, as in 1946, was again retained, along with other consultants. Studies were made and reports were written. As a direct outgrowth, the Legislature in 1953 passed a bill increasing our gas tax from 4½ to 6 cents, the tax on diesel fuel from 4½ to 7 cents and increased weight fees and other fees 33 1/3 percent.

In this brief time I've been able to express this blueprint only in the broadest terms. So much has been left unsaid that I fear that I haven't told the whole story. On the other hand, it is frequently the fault of a lawyer to use too many words to say the simplest of things.

At any rate, the results in California speak for themselves. After quite a bit of petty political skirmishing during the 1953 Session, the Legislature settled down and passed a tax increase bill, which everyone conceded would be done. The climate was right. Confidence in our highway administration was evident on every hand. The best proof of the practicality of our blueprint was the general acceptance by the taxpayers of the usually unpalatable increase in taxes. We have talked to literally dozens of legislators since these increases went into effect. All have expressed amazement over the fact that there have been no protests from their constituents. Another bit of evidence is the fact that the Legislature considered and finally discarded a scheme to earmark money for expenditure on mainline roads only. We like to think of this as a compliment to our administration of the highway program.

Concrete Results

I've spent most of my time on the blueprint. It would be perfectly proper for you to say, "That's all fine, but what did you build from your blueprint?" Well, being from California, I'm naturally modest. But since you have asked the question, I feel obliged to answer it.

Between 1912, when we first went into the highway business on a statewide basis, and 1945, we spent $500,000,000 on our State Highway System. (I'm talking only of construction dollars.) In the 10 years between 1945 and the end of the fiscal year in June of 1955 we will have spent or obli-,

. . . *Continued on page 64*

Excavation on Waldo Approach Poses Problem

(Photo following page)

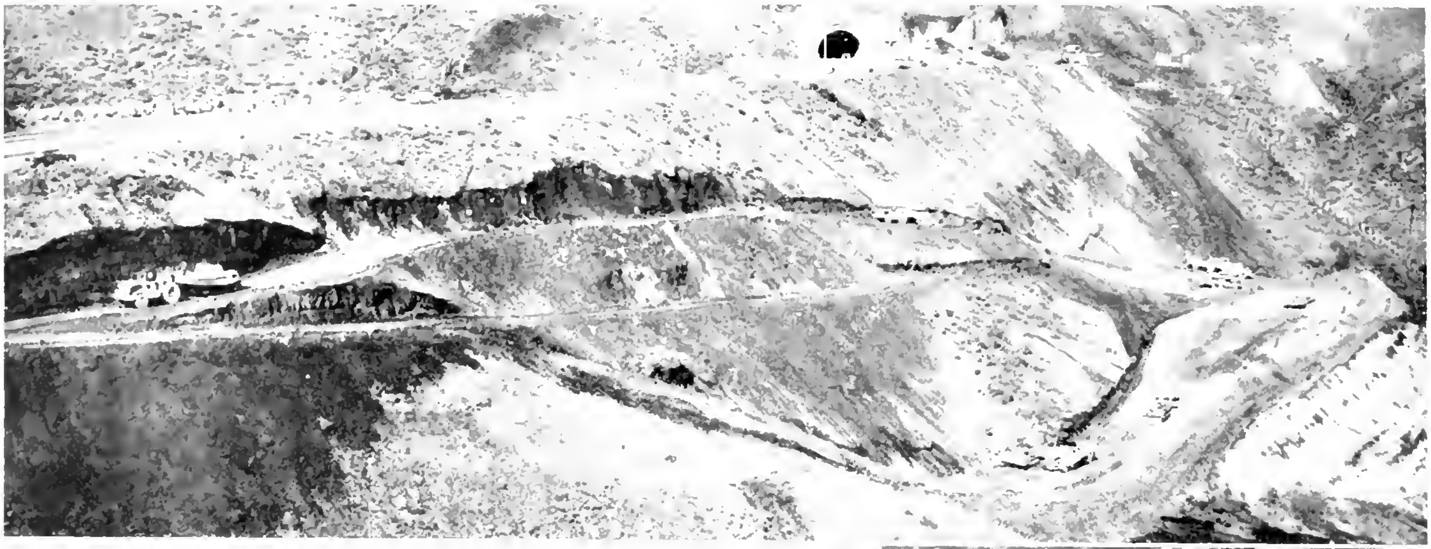
When, by the end of 1954, the Guy F. Atkinson Company completes its $4,122,382 contract for grading, structures, and portions of base and surfacing on the four-mile Waldo Grade approach to the Golden Gate Bridge, a major step will have been taken in breaking the bottleneck on the Marin County approach to this world-famous bridge.

The second contract for surfacing, median curb, and final incidentals will follow immediately.

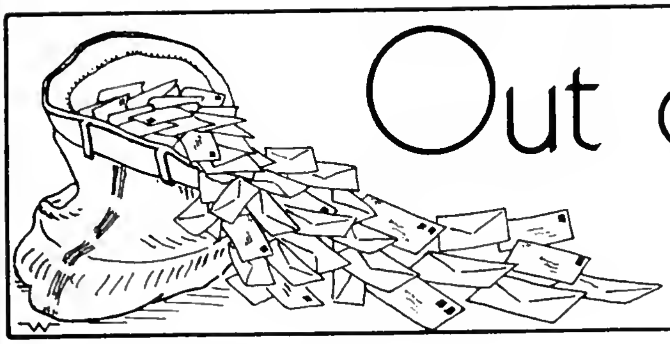
The project will convert the existing four-lane undivided highway into a modern six-lane divided freeway. This is being accomplished by construction of a new roadway approximately equal in width to the present highway. Three lanes for traffic in one direction will be constructed on the new roadway and the existing highway will then be reconstructed to provide three traffic lanes for travel in the opposite direction. The project involves construction of a second highway tunnel, two side-hill viaducts, a new undercrossing, new overcrossing, the extension of two existing undercrossings, and the extension of a military tunnel which crosses beneath the freeway.

Of primary importance during the construction period is provision for the 25,000 vehicles which must pass through the project daily.

Of particular interest will be the movement of 750,000 cubic yards of earth originating in new highway cuts which must be transported across the present roadway for construction of new embankments. Operations have been scheduled so that a new undercrossing has already been completed, which will ultimately serve to separate traffic entering or leaving the freeway from the City of Sausalito. In the meanwhile, excavated material is being transported through this undercrossing beneath the existing highway, to the end that traffic on the existing highway will not be subjected to the crossing of the contractor's equipment.



These photos courtesy of Caterpillar Tractor Company show construction on Waldo Grade approach to Golden Gate Bridge. An ingenious and carefully worked out sequence of construction operations is being followed with the result that the work is being accomplished with minimum interference to passing traffic.



Out of the Mail Bag

NEW NAME ON LIST

DEPARTMENT OF HIGHWAYS
of the
County of Cook
Chicago 6, Illinois

California Highways and Public Works

GENTLEMEN: My attention was called to your fine publication the other day. Inasmuch as I am in charge of the field-checking of all plans originating with our Cook County Highway Department many of the articles in your publication should prove of great interest and value to me and my associates, and if possible, I would appreciate having my name placed on your mailing list. You may be assured that all copies received will be read with interest.

Yours very truly,

STANLEY REZABEK
Hwy. Engr. III
Cook County Highway Department

COURTEOUS TREATMENT

OAKLAND, CALIFORNIA

JOHN S. DANIELS
Metropolitan District Right of Way Agent:

We would like you to know how pleased we were with our dealings with the Division of Highways in selling our home, at 1407 14th Street, Oakland. Mr. Edward W. Cutler and Mr. George N. Paul, Right of Way Agents, were most kind and understanding. We appreciate every kindness shown us. We feel they have both made friends among us.

Sincerely,

MR. and MRS. W. V. MORESI

WILL DO

CHAMPAIGN, ILLINOIS
May 5, 1954

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: I have been receiving copies of your periodical, *California Highways and Public Works* since January, 1954. Your publication is undoubtedly one of the best in its field and I read and reread every edition cover to cover. I intend to bind them yearly.

As of June 1, 1954, I shall be associated with the Bureau of Street Traffic in Chicago, and will change my address on that date. Would you be so kind as to send future editions to the new address.

ROBERT L. ZRALEK
6906 North Knox
Lincolnwood
Chicago 30, Illinois

HOW RIGHT

Alhambra, California

DEAR MR. ADAMS: For about 40 years I have been active in Chicago in politics and motor highway safety work.

As far back as I can remember when the automobile was beginning to take the place of street cars we in Chicago started to talk and hold committee meetings to improve automobile highways. In 1945 I retired from public life and moved to California. Here we have public highways of which our state officials can be proud as they did not talk about them and hold meetings, but they actually made them a reality.

I am certainly happy to be a Californian now where we believe in action. Our highway system is a good example.

Cordially yours,

FRANK J. TOMAZAK

MAGAZINE INFORMATIVE

ALFRED J. RYAN
Consulting Engineer
Denver 2, Colorado

California Highways and Public Works

GENTLEMEN: A large portion of my practice of engineering is related to the construction of modern highways. In the conduct of this practice, we have found a great deal of valuable information in your publication.

Yours truly,

ALFRED J. RYAN

COMPLIMENTS MAGAZINE

SUPERIOR MARKING EQUIPMENT COMPANY
San Francisco 5, California

KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: I wish to thank you for placing my name on the mailing list for the California state highway magazine. Already I have read the January issue from cover to cover and enjoyed it like all the other issues I have seen of this magazine. Beyond all doubt the magazine is a tribute to the periodical field.

Very truly yours,

LOUIS R. LAEREMANS

MAGAZINE IN CLASSROOM

LOS ANGELES 62, CALIFORNIA

MR. KENNETH C. ADAMS, *Editor*

If at all possible, I would like to be placed on your mailing list. I have used your magazine for teaching material and find that the students appreciate accurate, up-to-the-minute information which a textbook cannot contain. The wealth of material offered ties in with the entire school program and offers a medium for teaching safety along with mathematics.

Sincerely,

MISS THAIS E. HANCOCK

Quick Thinking Saves Life of Diver Working on State Bridge

QUICK THINKING and courage on the part of Gilbert B. Wilson, diver tender, averted a tragedy on the Richmond-San Rafael Bridge. Wilson saved the life of Charles J. Wendell, Diver-Construction Inspector, and has been officially commended by Director of Public Works Frank B. Durkee and Norman C. Raab, Projects Engineer of the Division of San Francisco Bay Toll Crossing.

In a succinct report of the incident to his superiors, Wendell said, "On starting to enter the west diaphragm from the NW shaft, one of the No. 11 vertical bars fell, fouling the diver's air hose and telephone cable. In trying to free myself I turned upside down.

"Rather than risk rupturing the dress or inflating myself to such an extent that movement would become impossible, it was necessary to close off the supply of air, which allowed water to enter the suit and collect in the helmet. The tender, G. B. Wilson, was informed of my predicament. He handed the phones to the engineer-in-charge, and immediately jumped into the water and was able to climb down the bar steel about 10 feet below water to reach me. I had floated up to the free length of my lines from point of entanglement. In the meantime, I had lapsed into unconsciousness from lack of oxygen. The tender was able to right me and, with the assistance of the engineer-in-charge and the boat operator, pulled sufficient slack in the lines to get me to the surface. The face plate was opened and the air supply turned on. At this point I regained consciousness.

"If it had not been for the courage and cool-headedness of the tender, G. B. Wilson, I probably would not be writing this report. He should be highly commended for his prompt and courageous action."

Director Durkee wrote to Wilson:

"I wish to join with Mr. Raab in commending you for your courage and the efficient manner in which you handled this emergency. This also will express appreciation on behalf of the entire Department of Public Works."

In this photograph C. J. Wendell, diver, is being prepared for an underwater trip by G. B. Wilson, the diver's tender, right, whose courage saved the life of Wendell. Photo courtesy Richmond Independent.

Retirements *from* Service

Bert A. Reber

Bert A. Reber, a state employee since 1921, retired May 8th from his position as an associate highway engineer with the Division of Highways. He last served in the Reports and Statistical Sections of the division.


BERT A. REBER

With the exception of two short periods as Engineer and Superintendent of the Alleghany-El Dorado Gold Mining Company, Alleghany, California, Reber's service with the State has been continuous for a total of more than 31 years.

Reber was born in Lindsay, Nebraska, December 22, 1892. He received his earlier education in the Butte, Montana, grade and high schools and later was graduated in 1915 as an engineer of mines from the University of Montana, School of Mines.

Early positions were with the Anaconda Copper Mining Company, North Butte Copper Company, and as engineer and assayer for the Boston and Corbin Copper and Silver Mining Company. All were in Montana.

Reber designed and supervised the construction of the hydroelectric power plant for the Absarokee Power Company, Absarokee, Montana. He then supervised the early operation of the plant until December of 1918.

Until he became associated with the Department of Public Works in December, 1921, as a hydraulic engineer with the former Division of Engineering and Irrigation, Reber worked for several mining companies as engineer, geologist, flotation mill operator, supervisor of leases and as mine and mining examiner.

. . . Continued on page 62

H. C. Van der Goes

Henry C. Van der Goes, Associate Architectural Draftsman, retired from the Bridge Department April 30, 1954.


HENRY C. VAN DER GOES

"Van," as he prefers to be called, was born in Holland December 23, 1892. His formal education included attendance at the Netherlands branch of Beaux Arts. Following this he traveled extensively in western Europe.

His American experience in all branches of architecture and allied engineering was obtained in the Midwest and California. This work involved both design and construction of industrial and office buildings, schools, colleges, churches, apartments, hospitals and bridges.

He entered state service with the Division of Architecture January 20, 1936, transferred to Headquarters Office of the Division of Highways October 16, 1941, and to the Sacramento Office of the Bridge Department January 20, 1943.

His professional work was interrupted for a year and a half in World War I during which he was on the French battlefronts in the Field Artillery. For a considerable period his disability resulting from the war has been

. . . Continued on page 62

Ruth Miles Wallauer

As a young lady, Ruth Miles on November 19, 1917, entered state service as a stenographer for the Department of Education. As Mrs. Ruth Miles Wallauer she retired on April 1, 1954, with the classification of permanent intermittent stenographer-clerk after many years of duty with the Department of Public Works, Division of Highways.


RUTH MILES WALLAUER

On July 1, 1918, she transferred to the Division of Highways; in November, 1922, went back to the Department of Education and on January 15, 1924, transferred to District X, Division of Highways.

On October 15, 1925, Ruth was granted a leave of absence to go to Europe and upon her return in 1926 was reinstated in District X. She resigned in April, 1934, to become Mrs. Carl Wallauer.

In July, 1934, she was given the title of permanent intermittent stenographer-clerk and served at intervals as her services were required in the Equipment Department, Central Office and Service and Supply Department of the Division of Highways and in the office of the Director of Public Works.

In the Department of Education in 1922 and 1923, Ruth was secretary-stenographer to Herbert R. Stoltz, Chief, Division of Physical Education, and in Highway District III and X was employed as chief stenographer.

John D. Moore

John D. Moore was honored by associates on May 6, 1954, with a noontime testimonial ceremony on the occasion of his last day with the Division of Architecture before retirement after completing 28 years with the State. Moore, the son of Edward M. and Gertrude Emily (Faulkner) Moore, was born on April 29, 1882, at Bayshore, New York. He attended grade schools and Islip High School at Islip, New York.

JOHN D. MOORE

The Moores moved to Batty, Nevada, in 1906. Then John obtained a job as freight clerk with the Las Vegas Tonapah Railroad. In 1907 he became freight clerk for the Tonapah Railroad at Springdale, Nevada. In the latter part of that same year he moved to Los Angeles where he was employed as a bookkeeper by the German Trust and Savings Bank from 1907 to 1914, subsequent to which he was the general bookkeeper for the Merchants National Bank of Los Angeles from 1914 to 1918. In the latter year he went to Alaska where he prospected for three years, after which he hauled fuel for the Fairbanks Golddredge Company. He returned to California in December, 1922.

The month of June, 1927, stands out as the most important month in Moore's life as it was in that month that he married Isabel Kimbell, originally from New Jersey. They have one daughter, Jesse Gertrude.

On June 14, 1927, Moore went to work for the Division of Highways. He was hired as a heavy truck operator, operating heavy trucks on force account road construction on the San Bernardino Big Bear Road. In 1928 when force account road construction was curtailed he was transferred to the Maintenance Department, being stationed in Westmorland from 1928 to 1930. In the latter year he was placed in charge of special handling of equipment in the Imperial Valley, and subsequently became subforeman in Indio and foreman on the San Bernardino-Running Springs Road. In 1931 he was assigned to the District VIII office in San Bernardino as assistant to the Assistant Maintenance Engineer with the title of timekeeper. A brief tour of duty in the field at Cajon Pass as maintenance leading man was followed by a 12-year assignment at Keen Camp, Riverside County, as property and equipment control man. In September, 1947, he was promoted to the rank of field office assistant in the Division of Architecture and assigned to the Division of Architecture's San Diego Office. When this became the headquarters for the Division of Architecture's District 6 in January, 1949, Moore assumed the function of chief clerk of the district. In this latter capacity he was in charge of all property, equipment, maintenance, fiscal, and clerical operations.

Mr. and Mrs. Moore intend to retire to their ranch at Stonyford, Colusa County, the northern boundary of which he points out is the deer hunting preserve boundary which gives him full season participation from his front porch. He intends to spend his time ranching and possibly traveling.

H. C. VAN DER GOES

Continued from page 61 . . .

recurring to such an uncomfortable extent as to cause his retirement. By having created new and enduring styles of bridge architecture he leaves an indelible imprint upon our bridges by economically combining functionalism and beauty. This spirit will be fostered by his assistants whom he trained. Training the men who work with him has always been one of his proudest accomplishments.

Van's art work has been reproduced in numerous publications and has been of inestimable value in developing public relations for the Division of Highways, besides assisting our designers in judging the finished appearance of their projects. He was also an expert in turning out realistic models to illustrate his ideas.

Henry with his wife Eda resides at 3114 Sixth Avenue, Sacramento. They have a week-end retreat somewhere in Pollock Pines. At both places there is ample equipment and opportunity for this artist-craftsman to enjoy his future leisure.

Francis B. Stewart

FRANCIS B. STEWART, Associate Highway Engineer in District XI at San Diego, will retire on July 1st after 23 years with the Division of Highways.

Stewart's career with the division began in 1931 when he went to work as an assistant resident engineer in District III, then located at Sacramento. In February of 1933 he was transferred to Los Angeles, and seven months later moved to San Diego where he first served as chief draftsman of the newly formed District XI and later as resident engineer on many important construction projects in the southern part of the State.

Stewart's services have proven particularly valuable in connection with special investigations, such as the scouting of material sites and the study and solution of complex hydraulic and drainage problems.

A native of Ashton in Clark County, Missouri, Stewart received his C.E. degree from the University of Missouri in 1915. From 1915 to 1922 he did surveying and general consulting work on various private drainage, sanitation, highway and mining projects. In 1923 he went to work for the Missouri Highway Department, first as chief of party, and later as resident engineer on highway and bridge construction jobs.

From 1926 to 1930 he was with the Kansas Highway Department, also as a resident engineer on bridge and highway projects.

BERT A. REBER

Continued from page 61 . . .

After service as a hydraulic engineer, Reber transferred to the Division of Highways as a civil engineering draftsman and served several years in Districts III and X. He was transferred to Headquarters in July, 1948.

HIGHWAY BIDS AND AWARDS

March, 1954

ALAMEDA COUNTY—At the San Francisco-Oakland Bay Bridge Distribution Structure in the City of Oakland, structure additions and miscellaneous road work to be constructed. District IV, Route 5, 69. Rothschild, Raffin & Weirick & Pacific Bridge Co., San Francisco, $4,314,071.50; Charles L. Harney, Inc., San Francisco, $4,441,086.25; Walsh Construction Co., San Francisco, $4,474,308; Stolte Inc., Gallagher and Burk, Inc., and Fred J. Early Jr., Co., Inc., Oakland, $4,523,481.25; M & K Corporation, Frederickson & Watson Construction Company and J. H. Pomeroy Company, Inc., San Francisco, $4,542,498.85; Williams & Burrows Inc., and Carl N. Swenson Company, Inc., South San Francisco, $4,560,536.85; Guy F. Atkinson Company, South San Francisco, $4,566,706.50; Peter Kiewit Sons' Company, San Francisco, $4,587,679; B. J. Ukropina, Polich, Kral, and John R. Ukropina, San Gabriel, $4,673,087; A. Teichert and Son, Inc., and John C. Giest, Sacramento, $4,686,772. Contract awarded to MacDonald, Young & Nelson, Inc., Morrison Knudson Company, Inc., San Francisco, $4,194,461.50.

CONTRA COSTA COUNTY—In the City of Walnut Creek at the intersection of Mt. Diablo Boulevard and Oakland Boulevard, a left storage lane to be constructed. District IV, Route 75, Section A. Ransome Company, Emeryville, $7,452; Gallagher & Burk Inc., Oakland, $7,583.90; O. C. Jones & Sons, Berkeley, $7,882.25; McGuire & Hester, Oakland, $7,945.25; Lee J. Immel, San Pablo, $7,979.50; J. Henry Harris, Berkeley, $9,016; Orinda Excavating and Paving Company, Lafayette, $9,240.60; Independent Construction Company, Oakland, $9,500.75. Contract awarded to John A. Carstensen, Castro Valley, $6,980.35.

CONTRA COSTA AND SOLANO COUNTIES—At Martinez and Benicia, the existing ferry slips to be repaired. District X, Route 75. H. F. Lauritzen, Pittsburg, $57,883.50; The Duncanson-Harrelson Company, Richmond, $59,350; Lord and Bishop, Sacramento, $60,240; Pacific Bridge Company, San Francisco, $68,550.50; Stolte Inc., and Cantor & Coull, Alameda, $73,155. Contract awarded to Healy Tibbitts Construction Company, San Francisco, $52,230.

HUMBOLDT COUNTY—Between 11.8 miles south and 1.2 miles north of Dyerville, nine (9) redwood trees to be felled, stumps removed, and portions of roadbed to be widened by grading and placing plant-mixed surfacing. District I, Route 1, Sections C and D. John Burman & Sons, Eureka, $12,275; Guy B. Hayden, Redway, $12,947; Mercer Fraser Company and Mercer Fraser Gas Company, Inc., Eureka, $13,990; Arthur B. Siri, Inc., Santa Rosa, $19,750. Contract awarded to Paul L. Woof, Fresno, $11,455.

HUMBOLDT COUNTY—Between 13 miles and 39 miles north of Eureka, drainage facilities to be constructed. District I, Route 1, Section I, J. Humboldt Construction Inc., Eureka, $3,923. Contract awarded to Mercer Fraser Company & Mercer Fraser Gas Company, Eureka, $3,108.36.

INYO COUNTY—For constructing cottage in Inyo County at Shoshone Maintenance Station. District IX, Route 127, Section P. Indian Wells Construction Company, Ridgecrest, $16,650; Dill and Robinson, Banning, $17,396. Contract awarded to Joseph A. Schlapp, Bishop, $15,669.

KERN COUNTY—Between Rademacher and Ridgecrest Road, bituminous surface treatment to be applied to shoulders. District IX, Route 145, Section B. Oilfields Trucking Company and Phoenix Construction Company Inc., Bakersfield, $6,326.50; Robert E. L. Parker Company, Claremont, $7,365; James E. Roberts, San Bernardino, $7,717; Geiser Construction Company, Buena Park, $8,163.75; George E. France Inc., Visalia, $11,729. Contract awarded to Bishop Engineering and Construction Company, Bishop, $6,093.60.

LOS ANGELES COUNTY—City of Los Angeles, at the Ramona Freeway-Santa Ana Freeway interchange, highway lighting and illuminated sign system to be furnished and installed. District VII, Route 2, 26. Mel Dennett Electric, San Bernardino, $32,747; Fischbach and Moore Incorporated, Los Angeles, $39,240; C. D. Draucker Inc., Los Angeles, $39,755; Chagnon Electric Company Inc., Baldwin Park, $40,910; A. S. Schulman Electric Company, Los Angeles, $43,623; Westates Electrical Construction Company, Los Angeles, $47,810. Contract awarded to Electric and Machinery Service, Inc., South Gate, $32,516.

LOS ANGELES COUNTY—In the City of Santa Monica between Olympic Boulevard and the southeasterly city limits about 1.3 miles in length to be widened and surfaced with asphalt concrete on existing surfacing and on untreated rock base. District VII, Route 60, Section SMca. M. S. Mecham and Sons, South Gate, $235,108.70; Griffith Company, Los Angeles, $240,365.50; Schroeder & Company, Sun Valley, $240,677.40; Vernon Paving Company, Los Angeles, $245,116.50; Oswald Bros. Company, Los Angeles, $251,472.60; R. R. Hensler, Sun Valley, $256,914.50; Robert E. L. Parker Company, Claremont, $291,697.70. Contract awarded to George Savala Paving Company, Hawthorne, $224,383.50.

LOS ANGELES COUNTY—Near the City of Maywood, Eastern Avenue at Cheli Air Force Base, a reinforced concrete undercrossing to be constructed and about 0.4 mile of roadway to be graded and surfaced with asphalt concrete on untreated rock base. District VII, Route 167, Section B. J. A. Thompson & Son, Inglewood, $136,301; Vido Kovacevich Company, Rosemead, $137,142.50; Griffith Comany, Los Angeles, $140,163; Ukropina, Polich, Kral and John R. Ukropina, San Gabriel, $142,629; J. E. Haddock, Ltd., Pasadena, $142,654.70; Norman I. Fadel, Inc., North Hollywood, $144,436.60; C. O. Sparks Inc., and Mundo Engineering Company, Los Angeles, $146,430.60; W. F. Maxwell Company, Los Angeles, $146,815; Byerts and Sons, Los Angeles, $147,732; Webb and White, Los Angeles, $153,868.10; L. S. and N. S. Johnson, Fullerton, $153,888.50; Westway Excavating Company, Los Angeles, $158,349. Contract awarded to N. M. Saliba Company, Gardena, $124,897.

LOS ANGELES COUNTY—Firestone Boulevard between Studebaker Road and Orr & Day Road, about 0.5 mile in length to be graded and surfaced with plant-mixed surfacing on untreated rock base and construct a reinforced concrete slab bridge. District VII, Route 174, Section B. Webb and White, Los Angeles, $387,257; Griffith Company, Los Angeles, $404,307.50; Cox Brothers Construction Company, Stanton, $422,035; Norman I. Fadel, Inc., North Hollywood, $454,351; W. F. Maxwell, Los Angeles, $489,757.50. Contract awarded to B. J. Ukropina, Kral, Polich, and John R. Ukropina, San Gabriel, $368,371.

RIVERSIDE COUNTY—Between Coachella Storm Channel and Jackson Street in Indio, about 2.1 miles to be graded and surfaced with plant-mixed surfacing on cement treated base and portions to be resurfaced with plant-mixed surfacing and on existing reinforced concrete bridge to be widened. District XI, Route 26, Section E. Basich Brothers Construction Company, R. L. Basich and N. L. Basich, South San Gabriel, $292,203.20; Norman I. Fadel, Inc., North Hollywood, $294,791.50; E. L. Yeager Company, Riverside, $307,861.25; Matich Brothers and Matich Brothers Paving Company, Colton, $313,732.25; Cox Brothers Construction Company, $318,234.65. Contract awarded to Ralph B. Slaughter, Julian, $266,614.25.

SACRAMENTO AND SAN JOAQUIN COUNTY—Across North Fork Mokelumne River at Miller's Ferry, a structural steel swing span bridge to be constructed and approaches to be graded and surfaced with plant-mixed surfacing. District III, Route 900. Payne Construction Company, Oakland, $308,625.85; Rolandi, LeBoeuf and Dougherty, Erickson & Pierson, Richmond, $311,494.55; Guy F. Atkinson Company, South San Francisco, $320,160.40; Stolte Inc., and Cantor and Coull, Oakland, $320,733.29; The Duncanson-Harrelson Company, Richmond, $333,756; Granite Construction Company, Watsonville, $337,377; Dan Caputo-Edward Keeble, San Jose, $342,087; George Pollock Company, Sacramento, $343,978.10, James B. Allen, San Carlos, $357,618; Thomas Construction Company, Fresno, $377,256.90; Wixson & Crowe, Inc., Redding, $385,106. Contract awarded to Ford and Bishop, Sacramento, $292,771.40.

SAN BERNARDINO COUNTY—For modifying traffic signal system and constructing concrete curb widening in San Bernardino County, at intersection of Colton Avenue and Waterman Avenue; District VIII, Route 26, Section A. Paul R. Gardner, Ontario, $9,980. Contract awarded to Drury Electric Company, San Bernardino, $9,291.

SAN BERNARDINO COUNTY—Between 0.5 mile south of Gish Underpass and Palmdale Road, about 17.4 miles in length to be graded and surfaced with plant-mixed surfacing on cement treated base and existing surfacing and two railroad underpasses to be extended. District VIII, Route 31, Sections B,C. R. A. Westbrook and Morrison-Knudsen Company Inc., J. V., Los Angeles, $1,575,708.50; Ukropina, Polich, Kral, and John R. Ukropina and Madonna Construction Company, San Gabriel, $1,576,474.95; Peter Kiewit Sons' Company, Arcadia, $1,576,498.85; John Delphia-John M. Ferry, Gordon H. Ball and San Ramon Valley Land Company, Patterson, $1,640,355.80; Clyde W. Wood and Sons, Inc., and Matich Brothers, North Hollywood, $1,647,140.10; Vinnel Company Inc., and Subsidiaries, Vinnell Constructors, Alhambra, $1,666,158; Dimmitt and Taylor and George Herz and Company, Monrovia, $1,682,063.95; J. E. Haddock, Ltd., Pasadena, $1,683,042.80; Frederickson and Kasler, Sacramento, $1,691,547.65; A. Teichert and Son, Inc., Baldwin Park, $1,693,418.50; Basich Brothers Construction Company, R. L. Basich and N. L. Basich, South San Gabriel, $1,728,158.65; Granite Construction Company, Watsonville, $1,763,973; G. W. Ellis Construction Company and L. A. and R. S. Crow, North Hollywood, $1,797,321.65; E. L. Yeager Company, J. A. Payton and E. L. Yeager Paving Company, Inc., Riverside, $1,858,617.10; McCammon-Wunderlich Company, Palo Alto, $2,015,958.12; R. R. Hensler, Sun Valley, $2,062,506.30. Contract awarded to Griffith Company, Los Angeles, $1,544,688.35.

SAN BERNARDINO COUNTY—At the intersection of Euclid Avenue with Fourth Street in the City of Ontario, traffic signal system and highway lighting to be furnished and installed. District VIII, Route 192. Electric and Machinery Service, Inc., South Gate, $17,110; Fischbach and Moore, Incorporated, Los Angeles, $17,777; C. D. Draucker Inc., Los Angeles, $18,820; Drury Electric Company, San Bernardino, $23,823. Contract awarded to Paul R. Gardner, Ontario, $16,240.

SAN FRANCISCO COUNTY—In the City and County of San Francisco, at Harbor Piers 24 and 26 and transit shed between Harbor Piers 24 and 26, automatic sprinkler system to be repaired. District IV, Route 68; Rockwood Sprinkler Company, San Francisco, $9,852. Contract awarded to Grinnell Company of the Pacific, San Francisco, $9,406.70.

SAN JOAQUIN COUNTY—On San Joaquin River at Garwood Ferry and on Potato Slough at Terminous Timber Pile, dolphins for two existing bridges to be constructed. District X, Route 75,53, Section A,C. Elmer G. Wendt, Rio Vista, $31,786; Lord and Bishop, Sacramento, $33,080; Healy Tibbitts Construction Company, San Francisco, $34,420; LeBoeuf-Dougherty Contracting Company and Erickson and Peirson, Richmond, $37,561; H. F. Lauritzen, Pittsburg, $39,693; Pacific Bridge Company, San Francisco, $57,500. Contract awarded to Stolte Inc., Cantor & Coull, Oakland, $27,585.

SAN LUIS OBISPO COUNTY—Between 13.6 miles and 15.3 miles north of San Simeon at various locations, metal plate guard rail to be constructed. District V, Route 56, Section A. Wulfert Company, San Leandro, $2,864.80; L. J. Grey & Sons, San Luis Obispo, $2,939.30; P. J. Zuiderweg, San Luis Obispo, $3,941.20; Bickmore-Harper, Inc., Santa Maria, $4,236; D. E. Higday, Temple City, $4,828.80; Stolte, Inc., Monterey, $4,903.56; Walter Bros., San Luis

Obispo, $7,764. Contract awarded to D. D. Galbraith & Robert F. Batty, Lompoc, $2,574.97.

SAN LUIS OBISPO COUNTY—San Luis Obispo County, Paso Robles Maintenance Station, Riverside Avenue at Sixth Street in the City of Paso Robles, truck shelter to be constructed. District V. Charles G. Wiswell, Pismo Beach, $11,985; Stolte, Inc., Monterey, $12,661. Contract awarded to E. C. Livingston Company, Inc., Paso Robles, $11,914.

SAN MATEO COUNTY—Between 1.7 miles south of La Honda Road and 3.0 miles north of Alpine Road (portions) about 1.4 miles in net length to be surfaced with plant-mixed surfacing on untreated rock base. District IV, Route 55, Section D. John A. Carstensen, Castro Valley, $37,445; O. C. Jones & Sons, Berkeley, $39,218.25; Douglass and Woodhouse, Redwood City, $39,270.80; L. C. Smith Company, San Mateo, $39,899.50; Browne and Krull, Los Altos, $40,824.50; Bragato Paving Company, Belmont, $41,601; George C. Renz Construction Company, Inc., Gilroy, $45,113.50; Granite Construction Company, Watsonville, $46,430; Joseph McFadden and Sons Inc., Palo Alto, $46,526.60; J. Henry Harris, Berkeley, $47,748.25; S.A.E. Company, Redwood City, $48,913.25. Contract awarded to Leo F. Piazza Paving Company, San Jose, $37,-217.10.

SAN MATEO COUNTY—In the City of Daly City on Alemany Boulevard at the intersection with Lynnewood Drive-Lake Merced Boulevard and at the intersection with Park Plaza Drive-Cliffside Drive, traffic signal systems, highway lighting and channelization to be constructed. District IV, Route 56, Section DLC. Charles L. Harney, Inc., San Francisco, $90,495.70; George C. Renz Construction Company, Inc., Santa Clara, $91,555.25; The Lowrie Paving Company, Inc., San Francisco, $93,098; O. C. Jones & Sons, Berkeley, $95,412; Eaton & Smith, San Francisco, $100,888; J. Henry Harris, Berkeley, $101,-948.90; The Fay Improvement Company, San Francisco, $102,202.70. Contract awarded to L. C. Smith Company, San Mateo, $85,155.

SANTA CLARA COUNTY—Between 0.2 mile south and 0.2 mile north of Hamilton Avenue, about 0.4 mile in length to be widened and surfaced with plant-mixed surfacing and traffic signals and highway lighting to be installed. District IV, Route 5, Section Cmb,B. L. C. Smith Company, Inc., San Mateo, $43,965.50; Joseph McFadden and Son Inc., Palo Alto, $45,208.40; Leo F. Piazza Paving Company, San Jose, $47,478.50; George C. Renz Construction Company, Ioc., Santa Clara, $47,846.80; Granite Construction Company, Watsonville, $50,407. Contract awarded to A. J. Raisch Paving Company, San Jose, $40,996.90.

SANTA CRUZ COUNTY—On Mt. Hermon Road between Camp Evers and Mt. Hermon, about 1.3 miles in length to be graded and surfaced with plant-mixed surfacing on untreated rock base. District IV, Route 1144. Leo F. Piazza Paviog Company, San Jose, $87,340.58; Fredricksoo Brothers, Emeryville, $99,786.90; George C. Renz Coostruction Company, Gilroy, $102,999.15; S. A. E. Company, Redwood City, $106,099.25; Edward Keehle, San Jose, $107,-646; Transocean Engineering Corporation, Hayward, $110,064; Guerin and Morgan, Los Gatos, $110,-207.60; Joseph McFadden and Son Inc., Palo Alto, $124,599.26; Paul E. Woof, Fresno, $131,222; McGuire and Hester, Oakland, $133,581.65. Contract awarded to Granite Construction Company, Watsonville, $86,628.

TULARE COUNTY—Prefabricated metal buildings and a loading platform to be constructed at Orosi Maintenance Station on El Monte Way, District VI, Route 130, Section A. Robert Jolly Construction Company, Fresno, $12,220; R. T. Dealy Compaoy, Inc., Avenal, $12,719; Lewis C. Nelson & Soos, Selma, $12,734; Guy L. Munson Company, Dinuba, $12,790; Ralph Utter, Tulare, $16,599. Contract awarded to I. B. Pipes Company, Fresno, $11,699.

TULARE COUNTY—At Deer Creek, about 14 miles south of Corcoran, corrugated metal pipes to be installed and about 0.2 mile of roadway to be graded and bituminous surface treatment to be applied. District VI, Route 135, Section B. Irv. Guinn Contractor, Bakersfield, $11,667.75; Thomas Construction Company, Fresno, $12,532.10; Gene Richards Inc., Fresno, $12,710.50; Paul E. Woof, Fresno, $12,-891.20; Gill Construction Company, Bakersfield, $13,062.25; Stewart & Squire Contractors, Corcoran, $13,203.75; Baun Construction Company, Fresno, $13,294.20; Volpa Brothers, Fresno, $13,442.88; Central Valley Construction Company, Hanford, $13,715; Griffith Company, Los Angeles, $15,675.50; Dicco Inc., Bakersfield, $16,557.75; L. B. Wells Construction Company, Visalia, $17,462.50; Stewart & Nuss Inc., Fresno, $17,984.25; N. M. Saliba Company, Los Angeles, $17,986.50; Hermreck and Easter Contractors, Santa Maria, $19,436. Contract awarded to Phoenix Construction Company, Inc., Bakersfield, $10,815.10.

April, 1954

ALAMEDA COUNTY—Between Hacienda Road and Dublin, about 4.9 miles in length, to be surfaced with plant-mixed surfacing on existing pavement and untreated rock base, and drainage facilities to be constructed. District IV, Route 107, Section B. McGuire and Hester, Oakland, $97,338.50; Lee J. Immel, San Pablo, $97,398.80; Gallagher and Burk Inc., Oakland, $100,743.84; Independent Construction Company, Oakland, $101,699.60; Fredrickson Brothers, Emeryville, $101,963; O. C. Jones and Sons, Berkeley, $102,606.30; J. Henry Harris, Berkeley, $103,-922.50; Silva Brothers, Hayward, $104,228.20; Close Building Supply Inc., Hayward, $104,692.10; Browne and Krull, Los Altos, $104,711.20; Stanfield and Moody, Tracy, $108,272.10; John A. Carstensen, Castro Valley, $109,984.68; Lee Construction Company, San Leandro, $111,054.40; Charles L. Harney, Inc., San Francisco, $114,303.80; Ball and Simpson, Berkeley, $118,795.10; L. B. Wells Construction Company, Visalia, $121,131.80. Contract awarded to Clements Construction Company, Centerville, $94,482.38.

ALAMEDA COUNTY—Along and across Arroyo Seco and Arroyo Las Positas, at Livermore Bypass, about 1.4 mile east of Livermore, a reinforced concrete bridge to be modified, a reinforced concrete bridge and timber bridge to be constructed and channels to be excavated. District IV, Routes 5, 108, Sections F.A. R. G. Clifford and C. O. Bodenhamer, Berkeley, $88,786.80; Lew Jones Construction Company, San Jose, $91,036; Robert R. Murdoch, Oakland, $91,501.50; O. C. Jones and Sons, Berkeley, $96,390; Norman I. Fadel, Inc., North Hollywood, $98,516.50; James H. McFarland, San Francisco, $98,783; B. E. Maxwell Jr., and Charles S. Moore, Sonora, $99,063.50; S and Q Construction Company, South San Francisco, $100,840; Underground Construction Company, Berkeley, $102,319.80; McGuire and Hester, Oakland, $103,657; George C. Renz Construction Company, Inc., Santa Clara, $108,717; C. K. Moseman, Redwood City, $112,636.50; Fredrickson Brothers, Emeryville, $114,319.50; Oscar C. Holmes, Redwood City, $114,833; Friant Construction Company, Fresoo, $115,055.50; Bos Construction Company and Ace Excavators, Berkeley, $123,-293.10; Johnsoo, Drake and Piper Inc., Oakland, $126,466.25; Edward Keeble, San Jose, $126,968.50. Contract awarded to Gene Richards, Inc., Fresno, $86,671.

AMADOR COUNTY—Between San Joaquin County line and 2.3 miles easterly, approximately seven miles southwesterly of Ione, about 2.3 miles in length, roadway to be graded and paved with plant-mixed surfacing on untreated rock base. District X, Route 97, Section A. John G. Mehren and Floyd O. Bailey, Sacramento, $160,725; A. Teichert and Son Inc., Sacramento, $163,851.25; Stewart and Squire Contractors, Corcoran, $166,947.40; Transocean Engineering Corp., Hayward, $167,348; McGuire and Hester, Oakland, $181,388.50; Thomas Construction Company, Fresno, $195,331; Nomellini Construction Company, Stockton, $197,944.50; Huntington Brothers, Napa, $199,871; Clyde W. Wood and Sons, Inc., North Hollywood, $207,313.50; M. J. Ruddy and Son, Modesto, $213,965.75; Harms Brothers, Sacramento, $218,075. Awarded to C. V. Kenworthy, Stockton, $154,808.10.

CONTRA COSTA COUNTY—In Mount Diablo State Park, between summit and Diablo Road, about 11.3 miles in length, to be widened and bituminous surface treatment applied. District IV. Gallagher and Burk, Inc., Oakland, $71,069; Fay Wills, Antioch, $73,711; Gordon L. Capps, Stockton, $75,522; McGuire and Hester, Oakland, $76,816; J. Henry Harris, Berkeley, $77,475.25; John A. Carstensen, Castro Valley, $87,944; L. B. Wells Construction Company, Visalia, $90,740; Gene Richards Inc., Fresno, $104,-000. Awarded to O. C. Jones and Sons, Berkeley, $68,370.

How Do We Blueprint?

Continued from page 55 . . .

gated for construction $1,122,000,000. We are presently investing in the improvement of our highway plant at the rate of about $1,000,000 every working day.

What are we accomplishing? In 1945 we had only 329 miles of multilane highway in our 14,000-mile system. Today we have 1,317 miles completed, under construction or advertised. One hundred twenty miles of this are constructed to full freeway standards and another 88 miles are under construction. Six hundred seven miles are constructed to expressway standards with limited access only; and the balance are four or more lanes of divided highway without limitation of access at the present time. We are now engaged in acquiring access along many miles of this presently unrestricted multilane highway.

Vehicle Registration Problem

Why are we doing all this? Well, I've already told you that we have 6,000,000 vehicles registered in California. That is about one-tenth of all the vehicles in the Country, and as recently as 1940 we had only 2,900,000. Our Hollywood Freeway in Los Angeles is carrying over 120,000 vehicles per day and predictions are that it will soon be carrying considerably in excess of that figure. Our San Francisco-Oakland Bay Bridge, with a designed capacity of 63,000 per day which was not expected to be reached until 1970 is now carrying an average of 87,000 vehicles per day with peaks as high as 109,000. Here's another way of more graphically stating our problem:

> *If all of the vehicles registered in California were traveling 40 miles per hour, at properly spaced intervals, they would fill a six-lane freeway stretching clear around the world at the equator; or they would occupy nine freeways of six lanes each stretching across the United States from the Atlantic to the Pacific.*

And I might add that just to keep us in business our vehicle registration is increasing at the rate of about 7,000 every week.

GOODWIN J. KNIGHT
Governor of California

FRANK B. DURKEE . . Director of Public Works

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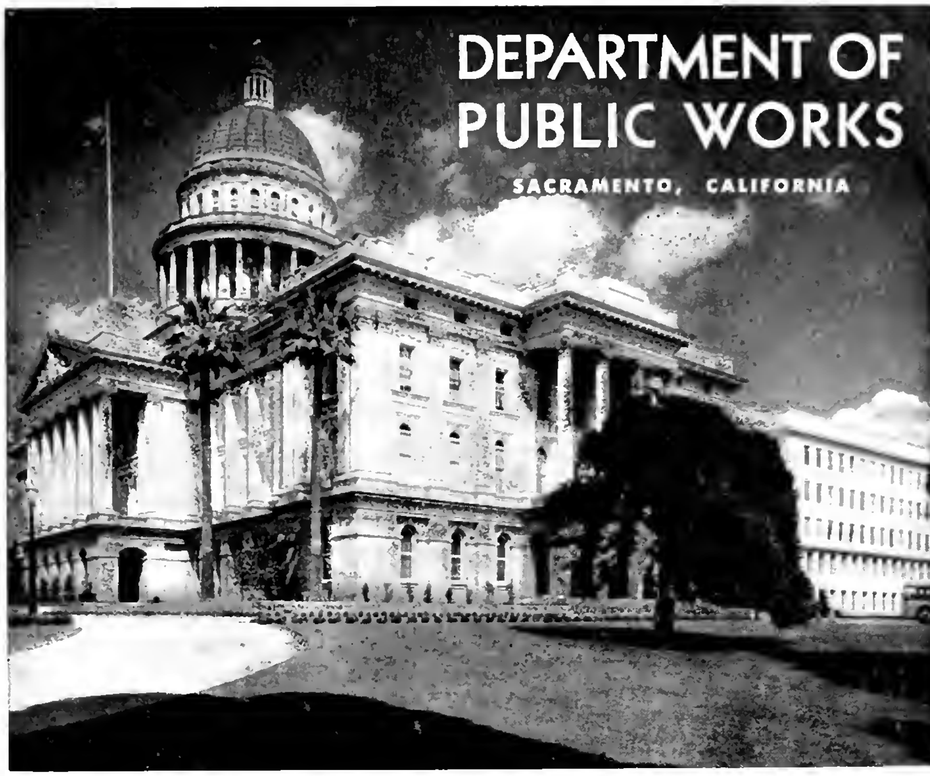

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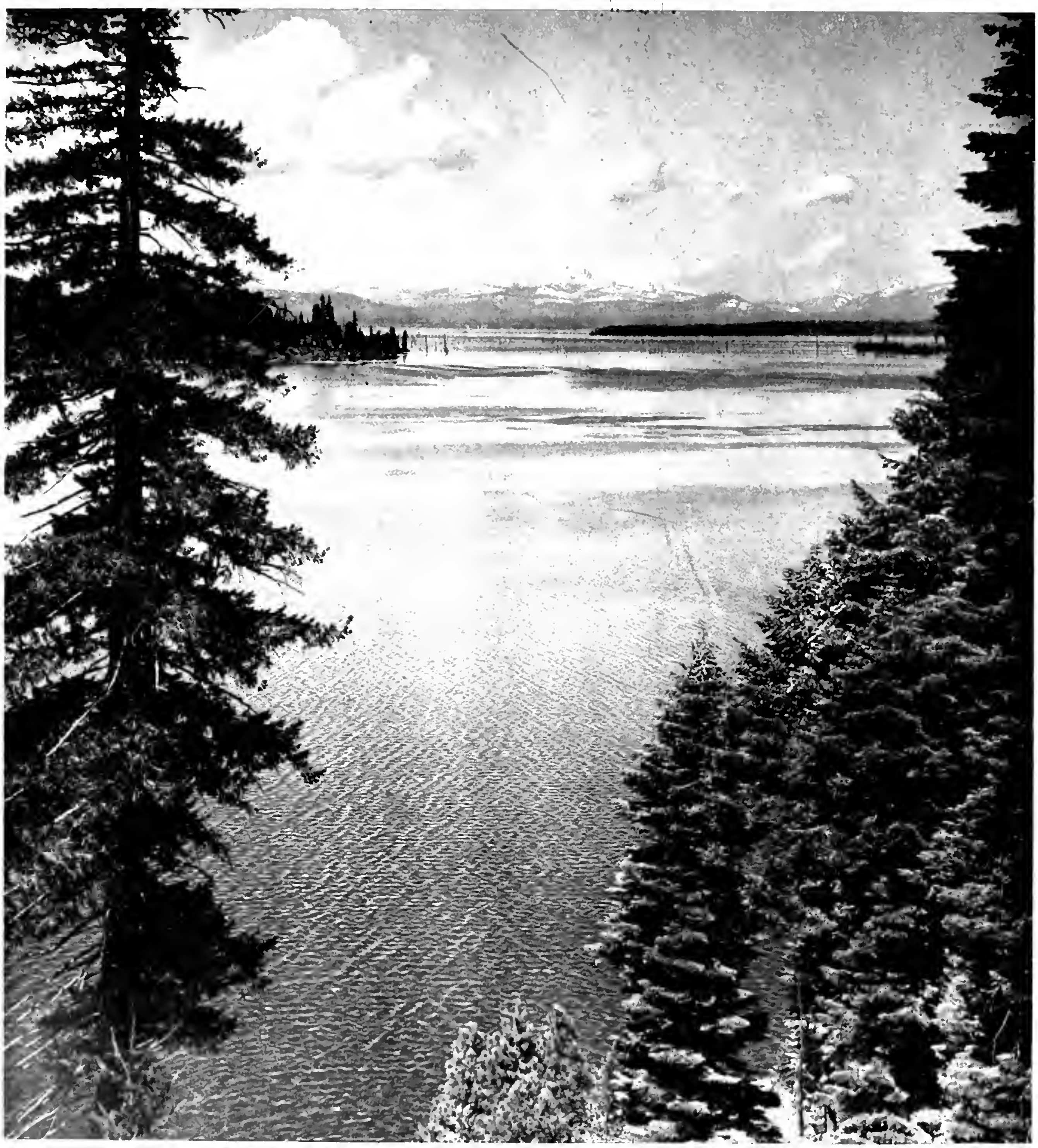

View of Lake Almanor in Plumas County taken from State Sign Route 89. Photo by Louis C. Dudley, Photographic Section, Department of Public Works.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

JULY-AUGUST
1954

California Highways and Public Works

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KENNETH C. ADAMS, *Editor*
HELEN HALSTED, *Associate Editor*
MERRITT R. NICKERSON, *Chief Photographer*

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Sacramento

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NOTICE

California Highways and Public Works is mailed under permit as third class mail. Therefore it will not be forwarded by the post office to an addressee who has moved even though a request to forward has been mailed. This office should be notified promptly of any change of address.

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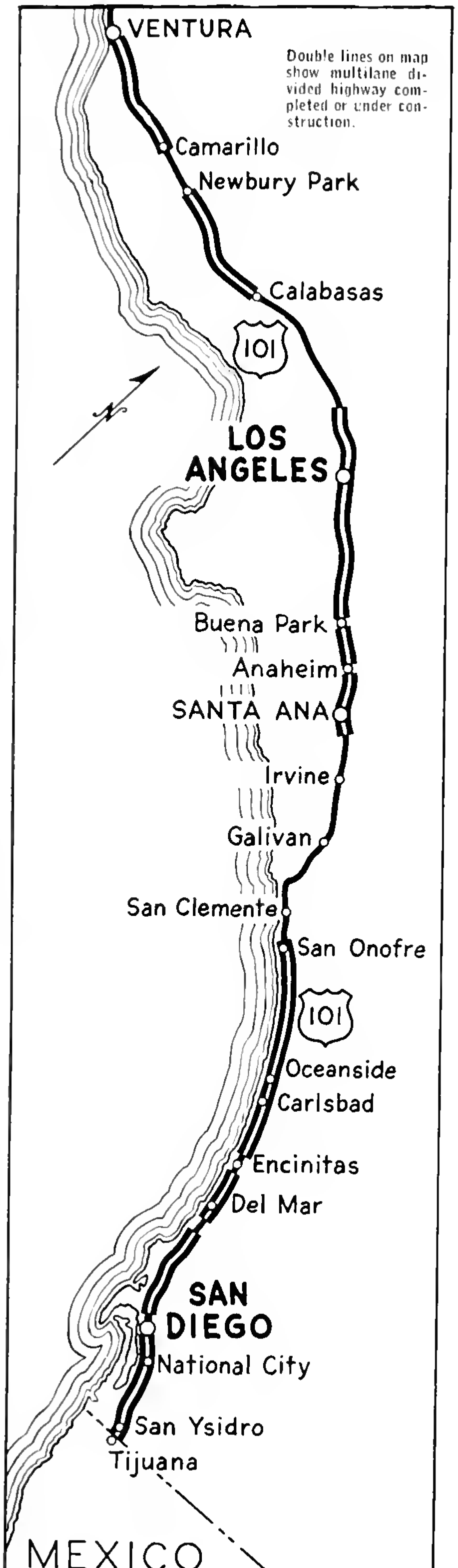
Multilane Sections On US 101

Report of Progress . . .
Mexican Border to San Francisco



US 101 from the Mexican border to San Francisco—California's most history-laden highway—is now within sight of a complete transformation from the horse and carreta road of the conquistadores and padres to a modern multilane divided highway 454 miles long.

Since World War II many miles of expressway and full freeway have been completed; during the past year alone the multilane mileage on 101 has increased 35.8 miles.

At the same time another 63 miles are currently under construction to expressway or full freeway standards, including a large proportion of freeways through major cities along the route. There still remains in the 1954-55 state highway construction budget another 10 miles of projects for which bids are to be advertised in the coming months.

The traffic importance of US 101 between the Mexican border and San Francisco cannot be overemphasized. It connects the most populous areas in California. It has scenic as well as economic attractions. Cities are growing and spreading along its route.

Gaps Are Closing

The steady improvement of 101, which received an added shot in the arm from the 1953 legislative increase in highway users taxes, is now rapidly taking shape. The individual projects are beginning to join up, forming longer continuous stretches of multilane expressway and full freeway.

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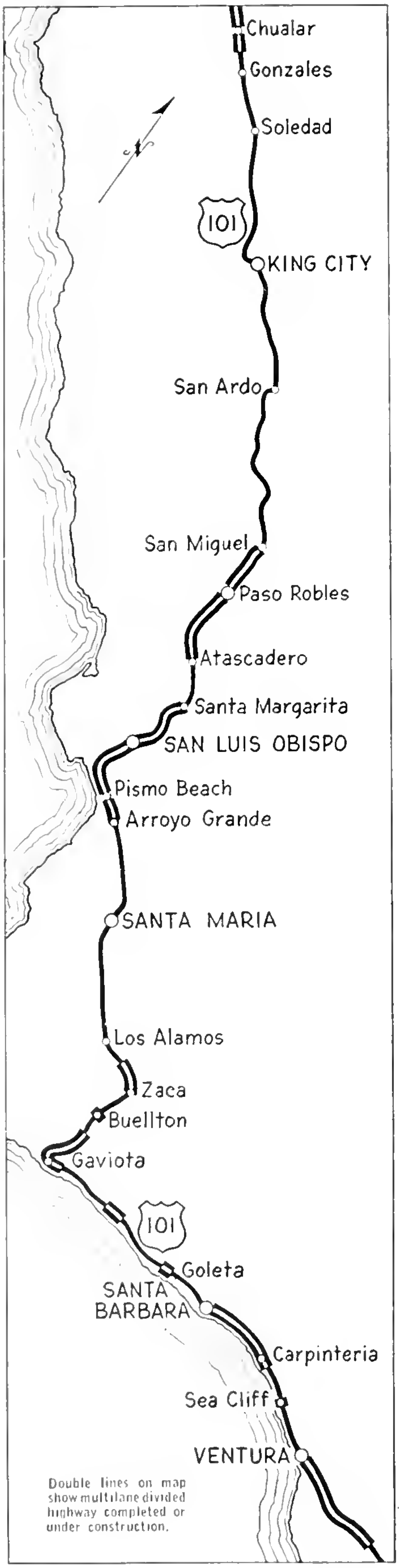
LOWER: Looking south along Oceanside-Carlsbad Freeway on US 101 in San Diego County. CENTER: In downtown Los Angeles traffic on Hollywood-Santa Ana Freeway passes unhindered beneath city streets. UPPER: Just prior to dedication of Camarillo Expressway in Venturo County, March, 1954.



In the rapidly growing San Diego area the last stretch of two-lane highway along US 101 between the metropolitan area and the Mexican border is being converted into a divided, four-lane expressway. This section, a four-mile project between Nestor and the border, is scheduled for completion by the end of the year at a cost of $1,200,000.

Within the City of San Diego itself, where large portions of US 101 are already four-lane divided, another two miles of full freeway is being constructed between one mile south and one mile north of Balboa Avenue, while to the north another project was recently completed which provided extra up-hill lanes for slow moving trucks on the Torrey Pines Grade.

Accidents Decrease

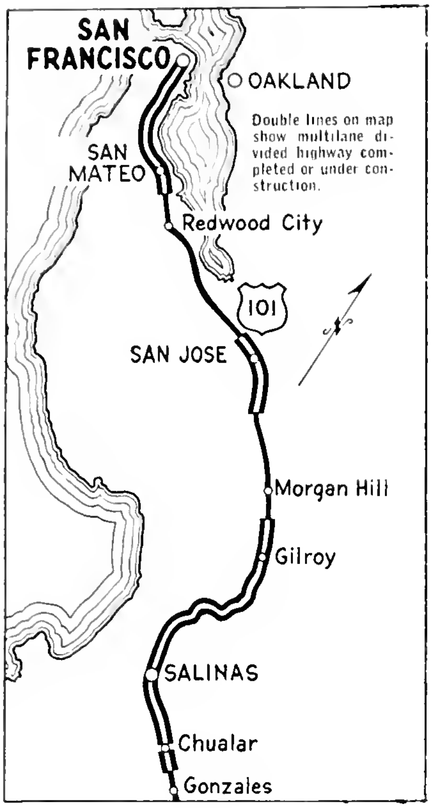
One of the most noteworthy jobs completed along US 101 during the past year was the Oceanside-Carlsbad Freeway which was formally thrown open to traffic in November. This 10½-mile project which cost more than $11,000,000 has brought much-needed traffic relief to the area and to motorists passing the area.

Even more important, traffic accidents and injuries along this section of highway have decreased 50 percent since the freeway was opened, a graphic demonstration of the great saving in life, limb and property built into every mile of full freeway where streams of oncoming vehicles are separated from each other and cross traffic is handled by separation structures and interchanges.

Also opened to traffic in April was the last stretch of the Hollywood Freeway between Hollywood Boulevard and Mulholland Drive, bringing to completion the 10-mile, $55,000,000 project. This freeway, between Hollywood Boulevard and the Los Angeles Civic Center, has the distinction of being the world's most traveled highway, accommodating some 168,000 vehicles per day.

The past year has seen the completion of another four miles of the →

LOWER: Looking north toward new tunnel through Gaviota Gorge in Santa Barbara County. CENTER: On Cuesta Grade, just north of San Luis Obispo. UPPER: Looking north on US 101 north of Chualar in Monterey County.



Santa Ana Freeway, bringing the total completed mileage to 28. Another five miles are under construction.

No Stop Lights

Completion of the going jobs along the Santa Ana Freeway will mean that, except for two short sections through Anaheim and Buena Park, a motorist will be able to drive for 45 miles along the Santa Ana and Hollywood Freeways through the heart of the Los Angeles metropolitan area without encountering a single stop light.

Heavy construction has also been going on along US 101 north of the Los Angeles area in Ventura and Santa Barbara Counties.

West of the junction with State Sign Route 23 in Ventura County the US 101 expressway is being extended another four miles through Newbury Park to the Conejo Grade summit.

Last March saw the formal opening of the 5½-mile, $3,000,000 Camarillo Expressway which will be extended another five miles to the Santa Clara River under a recently awarded $2,-000,000 contract.

Another going job is converting three miles of two-lane highway along the ocean into four-lane divided expressway between Punta Gorda, and the Santa Barbara County line at a cost of more than $2,600,000.

In Santa Barbara County the final work has begun on surfacing a new section of expressway which passes to the north of Carpinteria and extends nearly to Arroyo Parida Creek, a distance of 3½ miles. Cost of this project will be close to $2,000,000.

Gaviota Gorge

Santa Barbara County can also claim one of the more spectacular of the recently completed jobs, the expressway and tunnel through the Gaviota Gorge, opened to traffic last November.

Scheduled for placing under contract later this year is a $2,500,000 job to construct four miles of divided expressway one mile north of Las Cruces to one-half mile south of the Santa Ynez River. Another $1,000,000 project now under construction between Zaca and Wigmore is replacing the present curving, two-lane highway with six miles of divided, four-lane expressway.

In San Luis Obispo County work totaling $4,100,000 on three major expressway and full freeway projects is now under way.

A 3½-mile divided highway is being built to freeway standards from Arroyo Grande to Pismo Beach. Just north of Pismo Beach the existing highway has been constructed to expressway standards to San Luis Obispo.

Through the City of San Luis Obispo final work is being completed on a freeway which will greatly facilitate traffic flow through that city.

Paso Robles Improvements

Just north of Paso Robles work is proceeding along another stretch of expressway which extends north to

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LOWER: Looking north along completed portion of Salinas Freeway. CENTER: North along Bayshore Freeway in San Mateo County; Third Avenue interchange in foreground. UPPER: Looking south from near San Francisco-San Mateo county line, showing Bayshore Highway curving to right and two sections of fill in place for future overwater section across Candlestick Cove.

San Miguel, a distance of $6\frac{1}{2}$ miles. The south end of this project will tie into a future freeway route through Paso Robles.

In Monterey County, four miles of new expressway were completed in May between two miles north of Gonzales and Chualar.

Biggest going job in Monterey County is the bypass of the City of Salinas. To date, some $3,000,000 worth of work has been completed. Other projects, totaling $2,000,000, are now under construction.

A recently awarded contract for 1.6 miles through Gilroy will provide a wider, safer facility with a median strip separating opposing traffic.

North of San Jose is one of the heaviest traveled sections of US 101 in the State, the Bayshore Highway.

The Bayshore during the past year has seen the completion of two freeway projects, the 2½-mile section through San Mateo completed in January for $1,780,000, and the Army Street to Bryant at 9th and 10th Streets section in San Francisco completed last October at a cost of $5,000,000.

Bayshore Projects Under Way

Current construction is extending the full freeway south of San Mateo for another five miles to San Carlos, is building a 1.7-mile section from Alemany Street to Third Street in San Francisco, and is extending the elevated freeway in San Francisco from the Division Street Wye east to Fourth Street and west to Mission Street via 13th Street.

Work also is under way which will connect the Bayshore to the San Francisco-Oakland Bay Bridge including structures to provide a take-off for the future Embarcadero Freeway.

One of the most interesting features of the Bayshore work has been the construction of an open water fill between Sierra Point and Candlestick Point just south of the San Francisco county line.

With two sections of the fill totaling two-thirds of a mile already constructed, the California Highway Commission recently voted an additional $1,500,000 to continue the construction of another 0.9 of a mile. The fill will eventually carry a 3½-mile section of the Bayshore Freeway over the water between the two points.

Expenditures Over $65,000,000

Estimated total cost of the completed Bayshore Freeway, which will extend for nearly 49 miles from San Jose to San Francisco, will be around $110,000,000. Expenditures on the Bayshore to date now total more than $65,000,000 including rights of way.

The development of US 101 between the Mexican border and San Francisco is typical of the accelerated highway construction program now under way throughout the State.

However, with all this progress there are still many serious deficiencies on US 101 between San Diego and San Francisco. Studies and plans are in various stages of completion to correct these conditions. There are still 200 miles which are inadequate and which must be multilaned in the near future. The remaining gaps in the multilane construction through the Santa Maria and King City areas and in Santa Clara County are conclusive evidence of the need for a continued accelerated state highway improvement program in California.

HIGHWAY PROGRESS

By FRANK B. DURKEE, Director of Public Works

The year 1954 may well go down in highway transportation history as the year in which the struggle to overcome congestion, traffic accidents and other highway deficiencies finally turned in favor of the people of California.

No time has been lost in converting the increased revenues made available by the Legislature in 1953 into mile after mile of urban freeways, other wider and straighter highways, and new bridges. The accelerated highway construction program which has been under way since last summer is now reaching a new peak; it is adding to the capacity of California's highways in a manner that will save time, money and lives for those who drive and ride in our 6,000,000 motor vehicles.

Governor Goodwin J. Knight, Members of the Legislature, and the people of California have indicated their desire for, and great interest in, a program to speed up the improvement of the State Highway System.

We have been building good highways in California, but we have not been building them fast enough. We are behind traffic needs. However, on July 1st, we had completed 1,164 miles of multilane divided highways, and we had another 237 miles of that type under construction. This is a greater mileage of multilane divided highway than is available to motorists in any other state. More than 10 percent of the 14,000 miles on the State Highway System has now been constructed or is under construction to these standards.

Included in the completed multilane mileage are 135 miles of full freeways with all turning movements and cross traffic at separated grades and with completely controlled access. Another 120 miles of full freeway are under construction. The worth of this highest type of highway, in safety and convenience, has been conclusively demonstrated in the past decade in California.

Progress on the rebuilding of the State Highway System is illustrated in the articles on U. S. 40 and U. S. 101 which appear in this issue. With more than 400 highway contracts now under way throughout the State having a construction value in excess of $210,000,000, visible improvement is apparent on all sides. Some of the projects nearing completion and many that are in advanced stages of construction could not have been undertaken for several years if the augmented revenues had not been provided by the Legislature.

But with all of this progress, there still remain many miles of state highway inadequate for the traffic which

. . . Continued on page 61

Development of Historic US 40

In California—Freeway Sections Being Extended

EDITOR'S NOTE: The series of articles, of which the first two on US 40 and US 101 are in this issue, will be continued in the next number with progress reports on US 50 and US 99.

MORE nation-wide attention has been focused on US Highway 40 in the past two or three years than any other major route. US 40 has been the subject of a widely read book, the scene of a dramatic rescue when a train was trapped by snow west of Donner Summit, and an officially designated Trans-Sierra route of primary importance to the civilian economy and military requirements of the Nation.

The California portion of US 40, 213 miles long from San Francisco to the Nevada state line, includes some of the most modern mileage of the entire transcontinental route, with approximately 65 miles multilaned and divided and another 27½ miles under construction or budgeted as multilane expressway or full freeway.

In addition, surveys and plans are in various stages of completion for further development of this highway to adequate standards all the way from San Francisco to a few miles west of Gold Run, above the 3,000-foot elevation on the west slope of the Sierra Nevada. Studies are in progress for the ultimate development of the route as a multilane highway from Gold Run all the way to the Nevada state line.

Projects Under Way

The section of US 40 between San Francisco and the Carquinez Bridge is now the scene of much heavy and expensive freeway construction. Several multimillion-dollar projects are now under way, exemplifying the determined effort of the State to bring this important artery up to a standard adequate for the large volumes of passenger and commercial traffic which it carries.

In San Francisco—near the western terminus of US 40—two contracts are under way which will connect the San Francisco-Oakland Bay Bridge to the Bayshore Freeway, providing five blocks of viaduct with a construction cost estimated at $4,800,000.

In addition, to improve traffic conditions a series of contracts to be let soon will construct new ramps to the San Francisco-Oakland Bay Bridge at Yerba Buena Island and widen and improve the Toll Plaza.

In Alameda County at the East Bay Distribution Structure (US 40-US 50) a third level and new ramps which will eliminate all cross-weaving traffic movements are being constructed at a cost of $4,194,000.

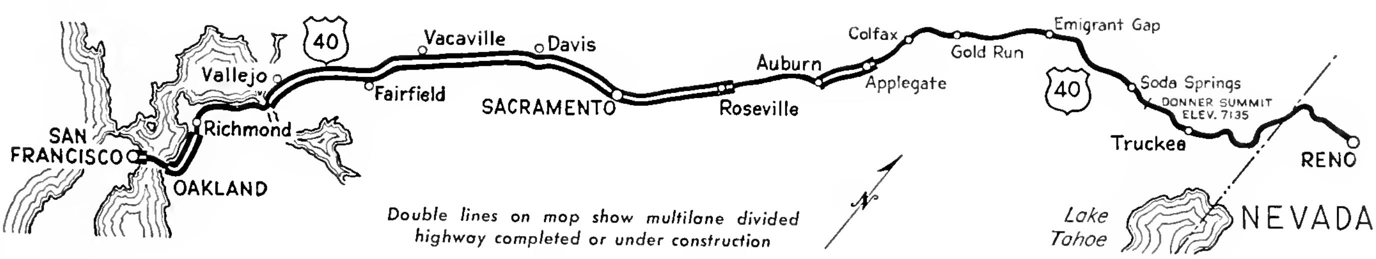
Between the East Bay Distribution Structure and the El Cerrito Overhead two contracts are under way and a third will begin in the autumn of 1954 which will convert the existing six-lane highway to 4½ miles of eight-lane full freeway almost as far north as the Contra Costa county line. Estimated total construction cost is $14,000,000.

In Contra Costa County—between Richmond and east of San Pablo—bids will be opened this fall on grading, paving and structures for 4.7 miles of full freeway on a new route for the Contra Costa portion of US 40. The State Highway Budget allocation for this project is $6,000,000. A $390,000 contract for an overpass of the Santa Fe Railway tracks in Richmond and a bridge across San Pablo Creek near the north city limits of San Pablo is already under way.

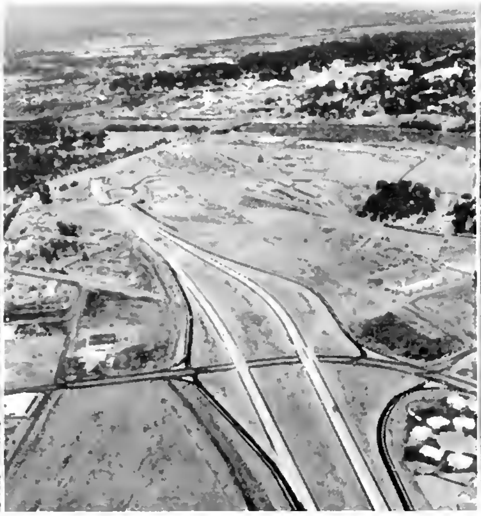
New Alignment a Freeway

The entire new route of US 40 in Contra Costa County, northeast from Richmond cutting through the hills to the Carquinez Bridge, has been adopted by the California Highway Commission and declared a freeway. Right-of-way acquisition has begun between San Pablo and Hercules. This section of freeway, which will replace the tortuous and congested four-lane undivided highway presently following the south shore of San Pablo Bay, will be so located as to connect with a future additional bridge across Carquinez Strait. Plans for this bridge are well advanced.

To the motorist, the most gratifying evident progress on US 40 since World War II is the unbroken stretch of four-lane highway which runs from the Carquinez Bridge to Sacramento, a distance of 60 miles. Four-laning of this section actually began as far back as 1933, but most of the expressway and freeway portions date from 1945 and later.



Double lines on map show multilane divided highway completed or under construction



LEFT: Eastshore Freeway, US 40, looking south toward downtown Oakland, showing construction under way on Powell Street separation structure. CENTER: Looking west along the recently opened West Sacramento Freeway. RIGHT: Near Sacramento-Placer county line traffic on existing US 40 crosses construction zone along new freeway route. View is east toward Roseville.

The sections completed to expressway standards in the past several years include:

Vallejo Wye to south of Cordelia, 10 miles, completed in 1950 for $2,200,000.

Cordelia Underpass to Fairfield, 6 miles, completed in 1952 for $1,250,000.

Fairfield Bypass, 4.7 miles, completed in 1949 for $1,300,000.

Vacaville Bypass, 1.7 miles, completed in 1952 for $1,000,000.

A new $700,000 US 40-99W connection west of Davis has just been completed.

Comparable in size to the multimillion-dollar freeway projects in the Bay area is the West Sacramento Freeway, opened to traffic on June 15, 1954. This $4,500,000 full freeway extends from the east end of the Yolo Causeway to the Tower Bridge across the Sacramento River, a distance of four miles, and provides the State Capital with a freeway approach from the west. The design of this project includes provision for a connection to a future bridge across the Sacramento River, necessary to provide a fully adequate western approach to Sacramento.

The section of US 40 between Sacramento and the high Sierra country has also come in for its share of improvement.

Northeast of Sacramento between the present eastern terminus of the North Sacramento Freeway and Roseville, three contracts aggregating $2,813,000 worth of construction are now under way for 13 miles of full freeway. The surfacing contract is still to be let. It is proposed to have this freeway open to traffic late in 1955.

Two New Freeways

In Placer County, where US 40 leaves the Sacramento Valley and bebins its long climb toward 7,135-foot Donner Summit, two new freeway routings have been adopted last year along the west approach to Auburn and from Colfax to near Gold Run.

Illustrative of the steady and continued progress in improving US 40 is the four-lane divided expressway beginning at Auburn, where the formerly congested business district is bypassed, and continuing eight miles through the Sierra foothills to Applegate. This multilane divided section will be extended another 2.6 miles east of Applegate by a project on which bids were scheduled to be opened on August 18th.

The speed with which surveys and plans along the not-yet-modernized sections of US 40 are translated into actual construction to provide a continuous stretch of divided highway extending perhaps 150 miles depends, of course, on the availability of future highway funds.

Steady Progress

Nevertheless, progress thus far in bringing US 40 up to modern standards has been steady and substantial since World War II, and particularly accelerated since last year when the Legislature increased highway user taxes. Undoubtedly, many of the projects now under way or budgeted on this route would have had to wait several years if the additional revenues provided by the 1953 legislation had not been available.

The continuous improvement of US 40 is one of the outstanding examples of the benefits of long-range planning for development of the through routes which are so important to a vast and growing state like California.

US 40 expressway through Sierra Nevada foothills east of Auburn

Skyline

San Francisco Freeways Provide Panoramic Views

By HERBERT S. MILES, Assistant District Engineer

The world famous skyline of San Francisco is a heritage of which the city by the Golden Gate has long been proud. Less than two decades ago many of the travelers destined for this city completed the last lap of their trip on a ferry, which afforded them an excellent opportunity to view this scenic splendor.

With the loss of the ferry boats, this beautiful approach to the city is all but vanished. The evolution of transportation shaped the portal picture into long lines of automobiles and busses traversing heavily-burdened roads and bridges. While passengers in vehicles entering from the north and east caught glimpses of the San Francisco skyline from the bridges, those approaching from the south were confined to a view of the immediate roadside development.

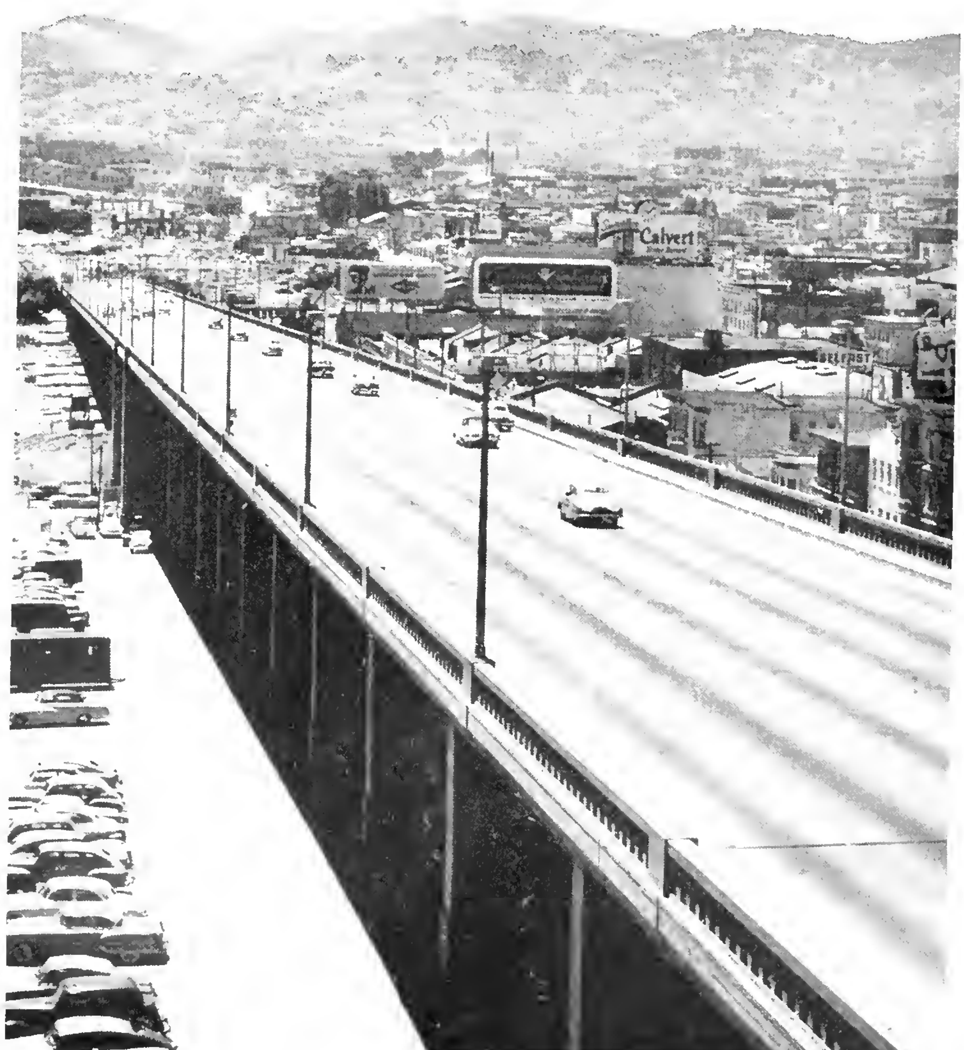
We are now in a transition to a new phase of transportation in this region, the Bay area freeways. As these are developed, the beauty which has long been San Francisco's fame will not only be restored to view, but will be unfolded to motorists entering from all directions. The recently completed section of the Bayshore Freeway between Army and Bryant Streets has opened an entirely new vista. Motorists skirt Potrero Hill on wide curves, and as they approach the elevated portion of the facility, a panorama of the imposing city skyscrapers develops with breathtaking suddenness.

Contracts Underway

This structure is the first link in a system of skyways which will provide a circumferential route around the central downtown district. The completed unit is a portion of the Bayshore Freeway which extends northerly from 17th Street to Bryant Street. This summer another section will be opened which will continue the roadway easterly to Seventh Street. Construction is also progressing on two additional contracts which, when completed next year, will extend to Third Street and also provide a connecting link to the San Francisco-Oakland Bay Bridge. Later this year, a call for bids will be made for the building of a subsequent unit with ramps which will reach to Main and Beale Streets at Mission Street. This latter project, the first section of the Embarcadero Freeway, will be extended northeasterly in the future to the waterfront, and thence will continue along the Embarcadero. Plans now on the drafting board reach north to the foot of Broadway. Studies to be made in the future will have as their objective the further development of this route toward the Golden Gate Bridge.

The present Bryant Street terminus of the Bayshore Freeway will soon take the form of a wye. From this lo-

Looking westerly toward Twin Peaks from the Bay Bridge Fifth Street ramp. The elevated connection to the Bayshore Freeway now under construction is shown in the distance.



Entering the city from the south the elevated structu

cation a skyway unit is rapidly taking shape which extends northwesterly along Thirteenth Street to Mission Street. Also on the drafting board are additions which will continue northerly to Turk and Franklin Streets. These additions as well as the units of the Embarcadero Freeway which are now being planned will be constructed with a two-level structure design with their dual roadways separated vertically. This type of construction will make it possible to provide for eight lanes of traffic with a minimum taking of property and with the least interference with traffic on cross streets during the construction period. Thus progress is being made on an ultramodern highway facility fully separated from city traffic, which ultimately will provide a connection between the main traffic arteries of San Francisco, the Bayshore Freeway and the two bridges.

Bayshore Freeway overlooking Potrero Avenue. Golden Gate Bridge and Marin Hills in distance.

Ultramodern Design

The section now in service and adjoining units in the construction stage are also ultramodern in design from a structural and architectural standpoint. The superstructure is fashioned with streamlined supports and girders of all-welded steel construction. This is the longest bridge project yet undertaken with a framework that has been assembled without the customary clatter of riveting hammers.

New features have also been incorporated into the deck of the structure. Curbs are of a unique design which includes a continuous recess at the lower part of the curb face. This development is the result of extensive field tests which revealed that the type chosen deflected vehicles which contacted the curb with more safety than types previously used. The rails are also in keeping with the other features of the structure. While they are simple in appearance, they are substantially stronger than former types. Yet they are low enough so as not to obscure the view, thus affording motorists an exceptional vantage point from which to see the great panorama of metropolitan San Francisco.

the freeway merge with the San Francisco skyline

While the primary purpose of this forward step in urban transportation is the expeditious movement of motor vehicles, the importance of aesthetic values involved is fully appreciated. The elevated roadways will form companion structures to the existing elements of the skyline which were themselves constructed to enhance the beauty of the city. These skyways are been designed with the view to pleasantly blend with their surroundings, and to complement the massive core of this progressive metropolis.

Created to relieve surface congestion, and a part of this metropolitan plan to solve the strangling traffic problem, this type of construction will become synonymous with the City of San Francisco, restoring to its people and to their visitors the opportunities of viewing the city which were lost with the departure of the ferries.

First Street off-ramp for dispersal of Bay Bridge traffic into commercial and financial districts

Eastshore Highway

Now Being Reconstructed To Modern Freeway

By J. F. O'BRIEN, Resident Engineer

The Eastshore Highway in Alameda County from the San Francisco-Oakland Bay Bridge northerly to the El Cerrito overhead is rapidly being reconstructed to modern freeway standards. This is being accomplished at a cost of 12½ million dollars under three separate construction contracts, the first of which is nearing completion, the second of which is well under way and a third and final contract now being readied for advertising.

The four-mile stretch of highway serves through traffic as a portion of US 40 and is the principal commuter route for residents of the Cities of Richmond, Albany, Berkeley and northern Oakland. The present highway is a six-lane divided facility the traffic capacity of which is greatly curtailed by four signalized grade intersections which serve to bring traffic to and from the highway from the east. Approximately 70,000 cars daily traverse this four-mile section and the resultant traffic congestion makes reconstruction to freeway standards an immediate necessity.

Will Be Freeway

The highway will be reconstructed as an eight-lane divided freeway with full traffic interchanges replacing the present overloaded signals. The first contract, covering the first mile northerly of the San Francisco-Oakland Bay Bridge distribution structure, is now nearing completion and will eliminate the Powell Street signals, the first of four signalized intersections, and provide in its place a traffic interchange of the diamond type. Freeway traffic will be carried over Powell Street on twin reinforced concrete structures of box girder design over 300 feet in length. Connecting ramps will provide uninterrupted flow of traffic to and from the freeway.

The second contract, now well under way and scheduled for completion in June of 1955, extends the new freeway beyond the second signalized intersection at Ashby Avenue, and provides for construction of a directional interchange at Ashby Avenue. Ashby Avenue traffic will be carried over the freeway on two reinforced concrete box girder structures the longer of which will be 460 feet. This second contract also provides for rough grading the balance of the four-mile stretch as far as the El Cerrito overhead.

View during construction on Powell Street interchange, which is now nearing completion. Traffic has been routed over a six-lane detour complete with temporary traffic signals during the construction period. Portions of this detour will be retained as a frontage road upon completion of the project.

The final contract soon to be advertised will provide full traffic interchanges at the University Avenue signals and at the Gilman Street signals and will include the balance of the new eight-lane pavement. Completion of the entire project is scheduled for the end of 1956.

Prior to construction of new embankments, over 1,000,000 cubic yards of soft bay mud has been removed to provide suitable fill foundations.

LEFT: Some idea of amount of dredger fill required for new Ashby Avenue interchange may be gleaned from this picture. Hydraulic fill will be shaped to provide roadways for trumpet loop of new interchange. Hydraulic fill is being placed at lower right of picture from a pipe line, visible in foreground, passing under existing highway. RIGHT: View of northerly portion of project with University Avenue intersection in foreground and El Cerrito overhead, northerly terminus of project, in background. Excavation to left of existing highway results from removal of some 400,000 cubic yards of unsuitable material prior to placement of hydraulic sand fill.

The new embankment was then placed hydraulically, utilizing sand obtained from a source in San Francisco Bay. The sand deposit is located approximately two miles from the job. The sand is overlaid with approximately nine feet of bay mud which was stripped from the site and pumped to disposal. The exposed sand was then dredged to an elevation 45 feet below mean sea level and pumped directly to embankment through a subaqueous pipe line. The embankment was placed in successive lifts of four feet at a rate of approximately 1,000 cubic yards per hour on a six-day, three-shift basis. The resultant high quality embankment will minimize differential settlement under the new Portland Cement Concrete pavement.

The work is under the supervision of B. W. Booker, Assistant State Highway Engineer, District IV, and both going contracts are held by Peter Kiewit Sons' Company.

Warm Springs to San Jose Section Open

An important link in the Bay area freeway system, the section of the Eastshore Freeway from Warm Springs to San Jose, was opened to traffic on July 2d.

This 9.3-mile unit will afford an important measure of relief to traffic on Sign Route 17 between San Jose and Oakland. Constructed to full freeway standards this modern, divided four-lane facility includes traffic interchanges at Brokaw Road, Trimble Road, and Alviso Road. Other structures on the project are bridges across Coyote River, Penetencia Creek, and underpasses at the crossing of the Southern Pacific and Western Pacific tracks at Warm Springs.

The project was constructed in two units. The first contract, 1.1 mile in length from Brokaw Road to Trimble Road, was completed last year by Fredrickson & Watson Construction Company and M & K Corporation at a cost of $1,235,000. It included the interchanges at each end as well as the bridge across Coyote River.

The work on the second contract which has just been completed was done by the Granite Construction Company at a cost of $2,758,000 for the 8.2-mile distance.

The cost of right of way for the entire project amounted to $849,000, thus making a total cost of $4,843,000 for the completed facility.

The southerly terminus of this section is temporarily connected to the Bayshore Highway with a signalized intersection near Gish Road. A future cloverleaf at this location will provide for the interchange of traffic between the Bayshore and the Eastshore Freeway and the proposed connection to the Los Gatos to Santa Cruz Freeway.

Laguna Creek

Improvement Is State and Joint Highway District No. 9 Project

By R. J. NORRIS, Resident Engineer

The Laguna Creek project on Sign Route 1 is one of a series of projects jointly financed by the State and Joint Highway District No. 9.

Joint Highway District No. 9, comprising San Francisco, San Mateo and Santa Cruz Counties, was formed in 1928 in recognition of the necessity for improving the Coast Highway between San Francisco and Santa Cruz because of its importance as a means of communication between coastal communities and because of its recreational, scenic, and defense values. Since the inclusion of this highway in the State Highway System in 1933, the joint highway district has continued to cooperate with the State in the financing of many improvements. The Half Moon Bay Bypass recently let to contract is the latest of these projects. Upon completion of this project, a high standard road will extend from San Francisco to Lake Lucerne, a distance of approximately 40 miles. From this point to the Santa Cruz county line plans are being prepared to realign some 10 miles of narrow, tortuous, substandard highway.

Immediately to the south, past Waddel Bluffs and Davenport, lie 10 miles of modern high-speed highway which terminated abruptly just beyond Respini Creek, where it reverted to 1.7 miles of narrow, winding, accident-ridden road which it was the purpose of the current Laguna Creek project to rectify. Now is gone the sight of the cement-laden trucks and trailers as they accelerated down the narrow, crooked, 7.1 percent grade, past historic Laguna Inn and across the 18-foot-wide Laguna Creek bridge, in a fruitless effort to postpone the shifting of all the gears on the trip up the grade to the southern rim of the canyon.

Curvature Reduced

Replacing the 18-foot, shoulderless roadbed which aggregated one complete circle of curvature with a minimum radius of 145 feet, there is a modern 22-foot plant mix surfacing on six inches of untreated rock base with 7-foot shoulders, with long, sweeping, horizontal and vertical curves. The curvature is equal to one-eighth circle with a minimum radius of 1,500 feet and a maximum grade of 5 percent. Traffic crosses Laguna Canyon on a fill having a maximum height of 45 feet. There is a saving of 7 percent in distance between the project termini.

The contractor began clearing work on this project on July 20, 1953. An HD-5 loader was successfully utilized to overturn the heavy growths of laurels and willows in Laguna Canyon by pushing with its bucket fully raised to create sufficient leverage. Excavation was then started for the 180-foot-long, 13-foot-square reinforced concrete box which was subsequently erected at a cost of $53,000 upon a 10-foot-deep beach-sand pad in Laguna Creek. This box, especially designed by the Bridge Department with a 2-foot-thick floor and deck and a 1.5-foot-thick sidewall to support 45 feet of fill, was connected to the existing solid rock tunnel under the Southern Pacific Railroad.

While this work was being done, the three-foot sand cushion upon which the major fill rests was being placed. Meanwhile, excavation work for a private road connection was being done as required in the contract as the first order of grading work. This was for the purpose of enabling the City of Santa Cruz Water Department to install a new 14-inch aerial pipeline across the approach cut. Practically the only blasting on the project was necessary here because of the hardness of the rock and because a thick layer of natural rock asphalt was encountered. Great care was exercised to make sure that the asphalt was not on fire from springing of the holes before attempting to place the main charges.

Fill Settlement Timed

As soon as sufficient sand blanket was in place to allow room to work, a ramp was cut in the existing steep

Looking south from north end of job, showing new shoulder, first course of plant-mix surfacing, and second course being placed and rolled

Looking south toward Laguna Creek fill

slope of the southern edge of Laguna canyon. After installing three settlement platforms to assist in control of embankment construction, the material from the ramp was distributed and compacted in the main fill using three DW-20 carryalls and two D-8 tractors and sheepfoot tampers. From this point on the contractor was restricted to five feet per week on the fill to avoid failure in the unstable basement soils.

In the weeks that this limit was reached, he moved back and graded the southern end of the project, building the fills part width on the southerly 1,500 feet where they ultimately would overlay the existing pavement. Alternating his work in this manner, it was possible to excavate almost all of the 110-foot-deep cut immediately south of the major fill during the open winter, meanwhile carrying traffic on the existing pavement.

Eventually, it was necessary to carry traffic over the new grade while completing the excavation in half-width lifts.

After the major fill had been brought to grade, an additional two feet of earth was placed as a surcharge for the purpose of accelerating settlement. This material was left in place for one month, during the latter two weeks of which there was negligible settlement. The surcharge was then removed and used to complete the geometrical section of fills which had been built part width.

Although the weather had proven extremely favorable all winter, there occurred two heavy spring rains which caused much damage and delay because of the large area of subgrade being utilized to carry traffic. During the current dry interval this damage has been repaired and placing of untreated rock base has begun.

Drainage Problems

Among the most interesting features of the project have been the employment of sag pipes and velocity dissipators to reduce outlet velocities on the necessarily steep transverse drainage installations.

In another instance, excavation below grade in a persistently soft area near the northerly terminus of the project disclosed an underground stream flowing at the rate of 2,000 gallons per hour. This area and many others, particularly in the shale cuts, required much unanticipated additional subdrainage.

Material to balance the job was obtained by daylighting several cut sections which, in turn, provided increased sight distances and greatly improved the scenic features of the project.

The work was nearing completion last month at a total construction cost of $337,000.

Construction was under the supervision of Assistant State Highway Engineer B. W. Booker and Assistant District Engineer R. P. Duffy. Edward Keeble was the general contractor and Dan Caputo was the subcontractor for the structures.

Bridge Innovations

New Operation Facilities On Richmond-San Rafael Span

By NORMAN C. RAAB, Projects Engineer, Divison of San Francisco Bay Toll Crossings

In the planning for the Richmond-San Rafael Bridge, a toll structure across the northern part of San Francisco Bay, careful consideration has been given to maintenance and operational features. These considerations resulted primarily from the stipulation contained in the bond resolution authorizing the sale of $62,000,000 of revenue bonds, i.e., that the maintenance and operation expenses are to be paid from bridge revenues.

Some of the features of this planning have resulted from the operational experiences of other toll bridges and improvements which have been made in facilities since the opening of the San Francisco-Oakland Bay Bridge.

Careful study was given to the detailing of all structural members to provide proper access to all parts for ease in cleaning and painting during the life of the structure. Consideration was also given to the cleaning of the deck and the approach roads within the limits of the project. In order to facilitate the maintenance and expedite the handling of the various cleaning and painting operations, the following facilities are being placed on the structure.

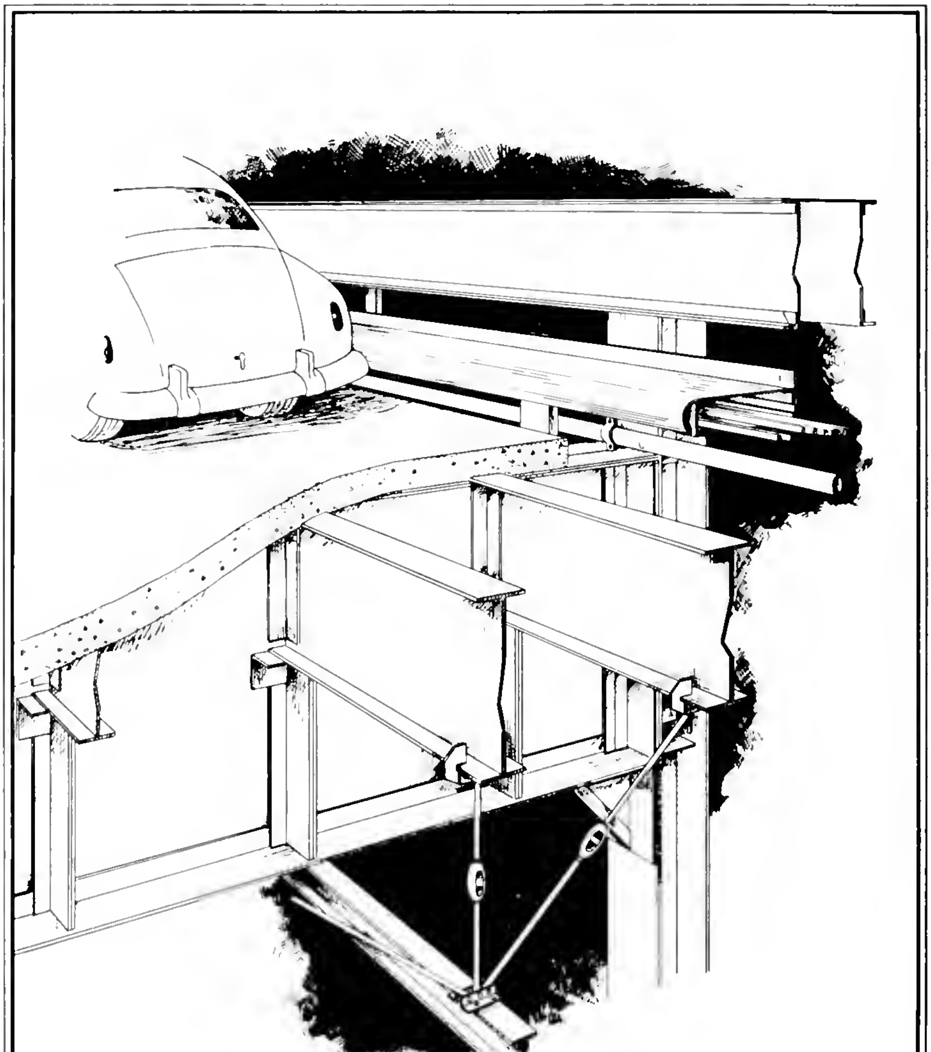
Air Compressors

A 2½-inch steel pipe will extend across the bridge from the maintenance building on the Richmond side to another maintenance building on the Marin County side of the bay, a distance of 4¼ miles. Electrically operated compressors with air receiver tanks are located in each building. Either or both compressors automatically cut in when the pressure in the system falls below certain pressure limits and cut out when the pressure exceeds the upper limit. This air will be used for cleaning structural members by sandblasting, for spray painting, and for operating the foghorns at the navigation channels.

Another 2½-inch pipe extends between these two maintenance buildings, supplying water on the Marin County side for sanitary and drinking purposes, and for cleaning structural members by washing, and for nominal fire protection on the bridge. A 15-horsepower electric motor, operating a multistage pump, boosts the water along the roadway level to a maximum height of 220 feet over the main navigation channel.

Also provided are three maintenance tracks under each deck throughout the steel portion of this structure. From these tracks will be suspended traveling maintenance gantries, or platforms, for use by the painters and for their supplies.

It is contemplated that the maintenance truck will transport the various crews with supplies to their respective



Maintenance tracks to carry traveling gantries stations in the morning and return for them in the evening. This should keep all vehicular traffic lanes on the bridge free of maintenance vehicles during the day. In case of emergency, or need of supplies, workers can contact the toll sergeant in the administration building at the Richmond end of the bridge by means of the bridge telephone system. There are numerous call boxes, at various locations, where portable dial-type handsets can be plugged in by the maintenance men for communication with the toll sergeant.

Electrical Energy for Span

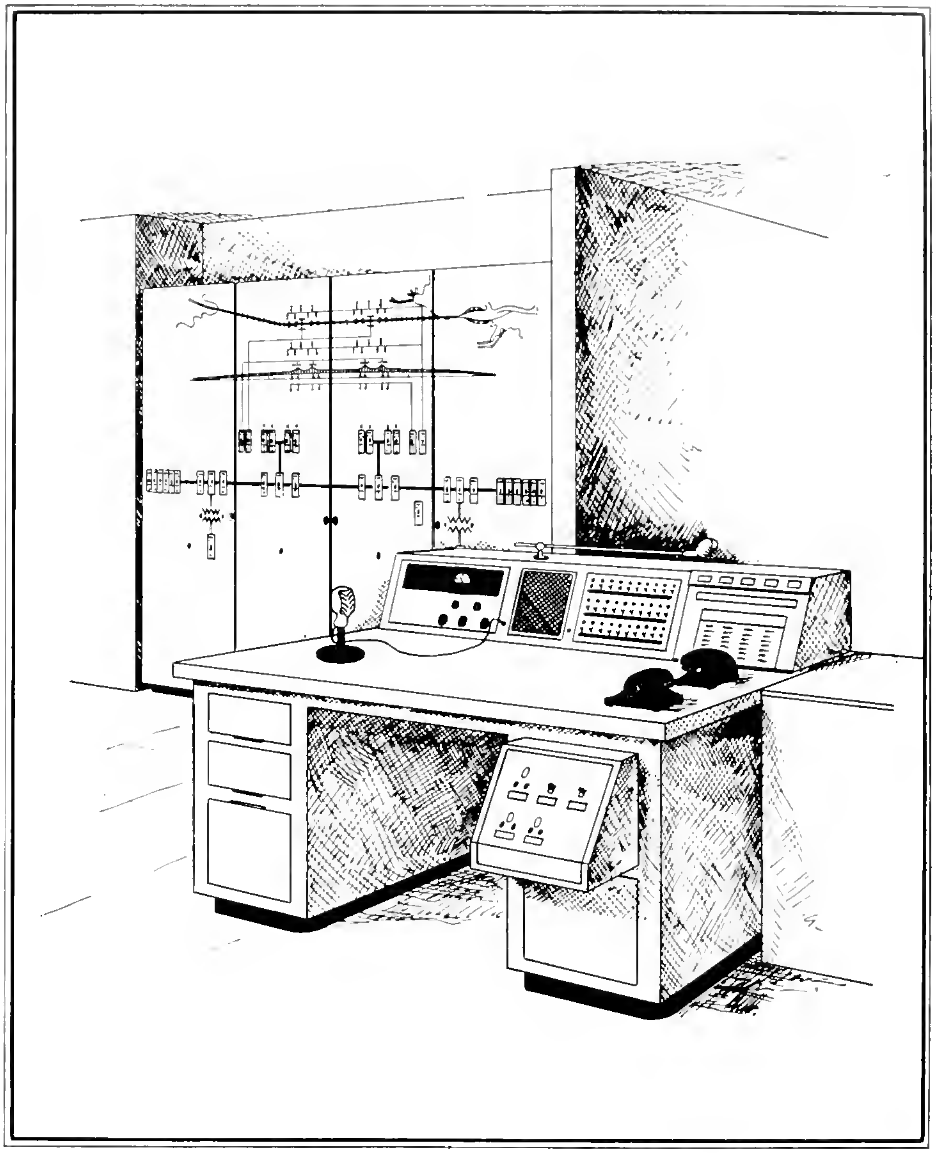
In order to facilitate not only initial placing of the various electric circuits but also the maintenance of such circuits, the power, control, and communication cables are laid in a steel trough under the curbs. There are four troughs sufficient for all of the bridge wiring; supplying, in addition, space for any public utility needs. These troughs will not only protect the maintenance workers from the wiring but will also provide space for new cables if and when needed.

Electrical energy for bridge operation is metered from both sides of the bay and in the event of a failure in power service from either Contra Costa County or Marin County automatic switching permits the power to be transmitted to the entire structure from the other source.

The roadway lighting, aviation beacons, and navigation signals are photoelectrically controlled and are so grouped that the units are controlled by the light intensity. In case of fog on one end of the $5\frac{1}{2}$-mile project, the lighting would be affected only in this area. The same would be true for the aviation and navigation aids.

Removable Curb Plates

The curb plates are removable throughout the length of the bridge to facilitate any repairs or the addition of new facilities. The steel curbs on either side of the 36-foot roadway have a half-round contact surface. This type of curve has been widely used on state highway bridges and has been found to be very efficient in preventing the wheels of vehicles from climbing when hit with a glancing blow. Additional space is also available between the curb and floor beams for utilities.



Toll sergeant's desk from which all operations of the bridge can be directed

A six-inch continuous clear opening between the under portion of the curb and the concrete slab affords a free passage of deck water in wet weather. Most of the road grime will be swept off the deck by the passage of wind through the opening. In the event that the roadway is periodically swept by mechanical means, the roadway dirt is brushed through the opening over the side of the structure.

Long-range Planning

Long-range planning was considered in the design of the superstructure of this bridge in the event of increased loads from any causes unknown at this time.

The floor system was designed with stringers, spaced at 4 feet 3 inches, on which was placed a 6-inch roadway slab consisting of $5\frac{1}{2}$ inches of lightweight concrete and a $\frac{1}{2}$-inch mortar wearing surface. The concrete deck is estimated to weigh 60 pounds per square foot, including the reinforcing steel.

The stringers, as spaced, can accommodate other lighter slabs, some of which weigh as little as 20 pounds per square foot. The replacement can be accomplished without change to the floor system and with a dead load reduction of as much as 2,900 pounds

. . . Continued on page 32

Bay Barrier

Eminent Engineers Are Conducting Investigations

The Abshire-Kelly Salinity Control Barrier Act of 1953 (Chapter 1104, Statutes of 1953), appropriated the sum of $250,000 and allocated an additional equal sum to the Water Project Authority of the State of California for making a study of barriers in San Francisco Bay. The act requested an investigation and study of the feasibility and economic value of construction by the State of a suitable barrier and public works incidental thereto at several alternative locations across San Francisco Bay, San Pablo Bay, Suisun Bay and at the outlet of the Sacramento-San Joaquin Delta. The purposes for which the barriers are to be investigated include reclamation of lands, salinity control, flood control and creation of a supply of fresh water for irrigation, domestic uses and related purposes. The act further requests that the Water Project Authority in making the investigation and study consider the physical and economic effects of barriers on navigation, transportation, levees, industries and agriculture adjacent to the bays, national defense, silting of the bays and channels, and fish life.

The investigation and study are being carried on for the Water Project Authority by the staff of its executive officer, State Engineer A. D. Edmonston. At the meeting of the authority held on July 3, 1953, the executive officer presented a program for the investigation, the procedure to be followed and a recommendation with regard to the employment of a board of eminent consulting engineers to advise on the investigation and study. It was recommended that this board include specialists in the fields of water supply and hydraulic structures, foundation and soils, geology, subaqueous structures, waste disposal and pollution, and transportation.

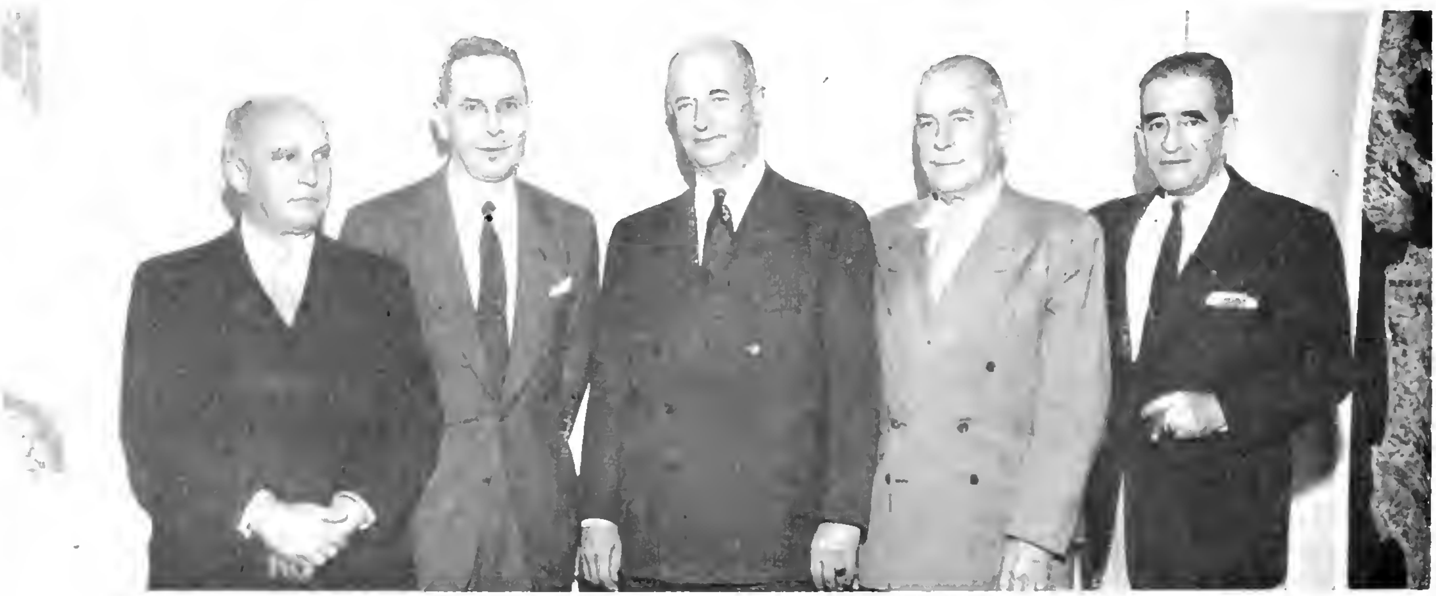
A committee of the authority composed of Attorney General Edmund G. Brown; State Controller Robert C. Kirkwood; and Director of Public Works Frank B. Durkee, was named to advise with the executive officer and select the five members of the Board of Consultants. The committee first selected Raymond A. Hill, consulting engineer of Los Angeles, as chairman and with his advice selected the other four members, Philip C. Rutledge of New York; Brigadier General Hans Kramer of San Francisco; Malcolm Pirnie of New York; and Charles E. DeLeuw of Chicago.

Hill Is Chairman

Hill is a member of the firm of Leeds, Hill and Jewett. He has had wide experience in water supply studies, the design of hydraulic structures throughout the West, and geology as applied to the design of such structures. He has assisted the State Engineer's Office and the Water Project Authority as a consultant on the Feather River Project and supervision of safety of dams.

Rutledge is a member of the firm of Moran, Proctor, Muesser & Rutledge, New York. This firm assisted in the foundation work on both the Golden Gate Bridge and the San Francisco-Oakland Bay Bridge. Rutledge is a former dean of the School of Engineering, Northwestern University. Both he and his firm are outstanding in the field of soil mechanics, underwater foundations and earth dams.

Board of Consultants composed of nationally known engineers. LEFT TO RIGHT: Charles E. DeLeuw, Chicago; Philip C. Rutledge, New York; Raymond A. Hill, Chairman, Los Angeles; Malcolm Pirnie, New York; Brigadier General Hans Kramer, San Francisco.



Governor Goodwin J. Knight meets C. Biemond, noted Dutch engineer, in his office in Sacramento. LEFT TO RIGHT: Director of Public Works Frank B. Durkee, Governor Knight (seated), State Engineer A. D. Edmonston, Raymond A. Hill, and Biemond.

General Kramer, a retired officer of the Corps of Engineers, U. S. Army, has had extensive experience in river, navigation and flood control projects. He was in charge of design and construction of the Conchas Dam and Reservoir Project and other flood control works in New Mexico and Colorado. He was also in charge of design and construction of a section of the Panama Canal.

Pirnie is the senior member of the firm of Malcolm Pirnie Engineers. He has an international reputation in the fields of water supply, sanitation and stream pollution. He is a trustee of the Harvard School of Engineering and is a past president of the American Society of Civil Engineers.

DeLeuw is president of the firm of Deleuw, Cather and Company of Chicago. He has had more than 30 years' experience in the field of transportation, including investigations and reports to many public bodies and railroads, and the design and supervision of construction of railroad and highway facilities.

Following considerable discussion with regard to the employment of an engineer from The Netherlands familiar with the reclamation of submerged lands in that country, and the problems related thereto which would be similar to those encountered in the San Francisco Bay Barrier investigation, the authority authorized Hill while on a trip to Europe on other matters to interview engineers in Holland with the objective of recommending the employment of one of them as a consultant. Based upon his findings of qualifications of the men interviewed, Hill recommended to the executive officer that Ir. C. Biemond be retained by the authority for a period of approximately two months.

Biemond is an outstanding engineer of long and broad experience in The Netherlands in the reclamation of lands, the conservation of water and the prevention of pollution of fresh water lakes by salinity intrusion, all of which matters are pertinent in the San Francisco Bay Barrier investigation. He arrived in California on June 14, 1954, and is presently working with the staff of the State Engineer's Office in the solution of the many problems involved in the determinations to be made in connection with a report on San Francisco Bay barriers.

In Memoriam

EDWARD HYATT

Death on June 17th deprived California of its most outstanding authority on water conservation and resources. Edward Hyott, 65, who retired as State Engineer in February, 1950, after 36 years of service with the State, died in Sacramento after a long illness.

Hyatt started with the State in 1914 under Governor Hiram W. Johnson as Engineer for the State Highway Commission.

Two years later he transferred to the new State Water Commission, which was in charge of water rights in California.

In 1922 he was named Deputy Chief of the Division of Water Rights and advanced to the position of Chief in 1924 under an appointment by Governor Friend W. Richardson.

Hyott took the job as State Engineer in October, 1927. He was appointed by the late Bert B. Meek, Director of Public Works, with the approval of Governor C. C. Young. The engineer served on many boards and commissions dealing with water problems. One of the most important posts was Executive Secretary of the California Water Project Authority.

In the 1920s Hyatt directed the surveys which led to the development of the State Water Plan and the CVP.

The engineer was born July 21, 1888, in San Jacinto, Riverside County. He received his engineering education at Stanford University.

His first job was with the United State Geological Survey. Surveys were made by small parties of men with a pack train of mules. Much of his work was done with the late Colonel Robert B. Marshall, who conceived the plan for the CVP.

After his work with the Federal Government, Hyott entered private employment between 1912 and 1914 with the San Joaquin Light and Power Corporation.

Hyatt is survived by his widow, Delta; daughters, Dolly Hyatt of Los Angeles and Mrs. Horace D. McClure of Springfield, Mass.; and sisters, Mrs. Shirley Willits of Corona, Antonia Hyatt and Mrs. Phyllis Gardiner of Sacramento.

NEW COLORADO FREEWAY IS OPENED TO TRAFFIC

By J. E. McMAHON, Bridge Engineer, Southern Area

A colorful procession of horse-drawn carriages and early model automobiles marked the opening to traffic of the westbound lanes of the Colorado Street Bridge on October 8, 1953.

On June 25, 1954, without additional ceremony, the remaining portion of the Colorado Freeway from Holly Street in Pasadena to Avenue 64 in Los Angeles was thrown open to traffic.

Eighty years before, on January 27, 1874, the founding of Pasadena took place on the east bank of the Arroyo Seco, on the plateau which rises 170 feet above the bottom of the canyon. Undoubtedly, the Pasadena pioneers gave some thought to the problem of crossing this deep ravine which separated them from the growing communities to the west and south. The crossing was first made on relatively small bridges in the bottom of the canyon, with narrow, winding approach roads in and out of the arroyo. With the growth of the city, and with increasing developments in transportation, these low-level crossings soon proved inadequate.

The city fathers met this challenge by authorizing a bond issue of $100-000 which was matched by the County of Los Angeles to provide funds for a new structure. This multiple-arch bridge, which was completed in 1913, has become a familiar landmark to residents of the Pasadena area.

The Colorado Freeway, now in the process of construction, is the answer of state engineers to the problem of improving transportation facilities between Pasadena and portions of Los Angeles and Glendale. The line of the freeway will roughly parallel existing Colorado Street, which has been the main thoroughfare in this area. The portion of the freeway which is now completed, or under construction, connects Holly Street in Pasadena with the intersection of Colorado Street and Eagle Vista Drive in Los Angeles.

An important feature of the new freeway is the recently completed six-lane Colorado Street Bridge, which was built in close proximity to the original two-lane structure. One of the problems in the design of the new bridge was to provide a type and style of structure which would not conflict in appearance with the existing bridge.

The entire section of the freeway, from Holly Street in Pasadena to the intersection of Colorado Street and Eagle Vista Drive in Los Angeles, is 2½ miles in length. The estimated total cost of the construction work is $5,500,000. The project was divided into four separate contracts.

The first three of these contracts covered the construction of 1½ miles of freeway at an estimated cost of $4,600,000. Work under these three completed contracts was performed by the Guy F. Atkinson Company.

H. R. Lendecke represented the State Bridge Department on all structure work. L. E. Steele represented District VII in connection with highway construction work under these contracts.

The fourth and remaining contract, which includes that portion of the freeway between Avenue 64 and Vista Drive, was awarded on May 14, 1954, to Peter Kiewit Sons' Co. of Arcadia. Construction work is now in progress and is scheduled for completion in June, 1955.

The opening of the completed section of the Colorado Freeway is a great step forward in relieving traffic congestion in the Pasadena area. It is an important link in the integrated freeway system which is being pushed to completion in Southern California in an effort to keep pace with the tremendous growth of this metropolitan area.

MARGIN OF SAFETY

Nearly all motorists allow themselves enough road space to take care of normal needs. The safe driver allows extra space for emergencies.

Industry and Frontage Roads

By
JOHN F. KELLY
Headquarters Right of Way Agent

EDWARD P. REILLY
Right of Way Agent District VII

A frontage road is a local street or road auxiliary to and located on the side of a freeway for service to abutting property and adjacent areas, and for control of access.

Los Angeles is the fourth largest industrial center in the United States, and is more dependent upon the motor vehicle than any other major population center in the world. The great bulk of all transportation, to, from, and within the area is by motor vehicle. This includes the carrying of both passengers and freight. While the railroads still haul the bulk of interstate freight shipments, trucks handle most of the intrastate freight.*

The growth of Los Angeles in economic stature and an ever increasing number of vehicles has made the traffic situation in Los Angeles one of the foremost problems in the nation. The development of a network of freeways in metropolitan Los Angeles has been found to be the best solution toward solving this problem.

FREEWAY THROUGH INDUSTRIAL AREA

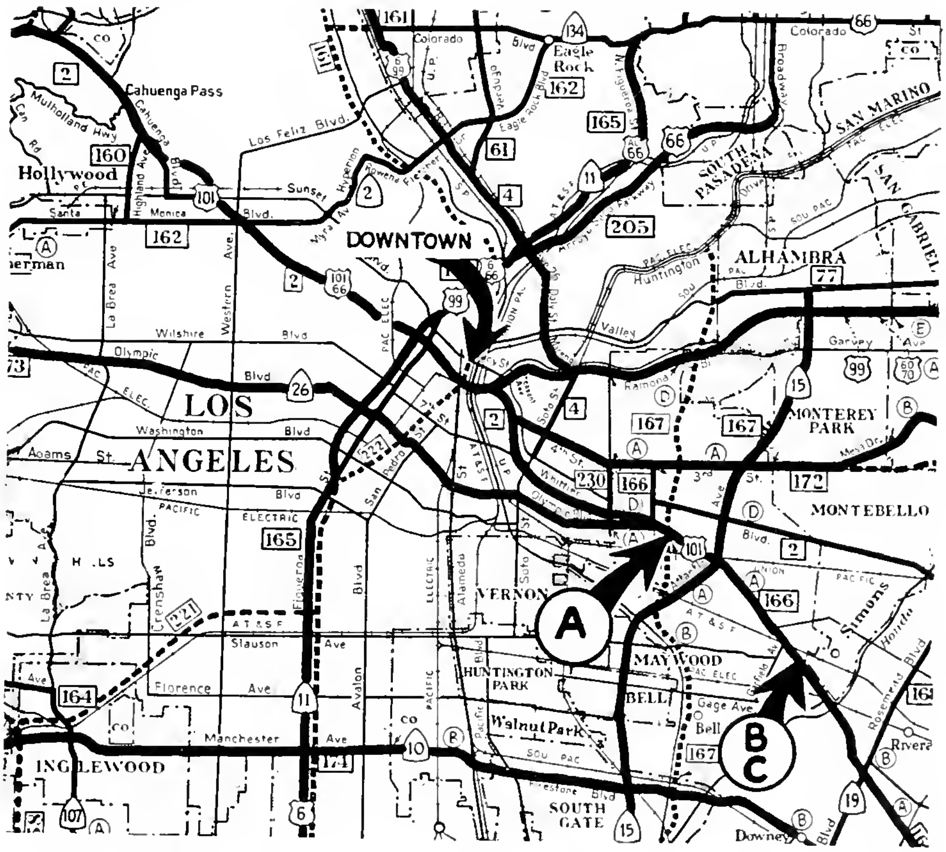
The Santa Ana Freeway, extending southeasterly from downtown Los Angeles is the first freeway in the city to be routed through a major industrial area. Beyond the built-up downtown area considerable unimproved land has become more accessible to the central section of the city by reason of this freeway. Knowledge of the route prior to construction encouraged the location of many new industries in the vicinity anticipating the freeway construction. The principal new industrial activity starts at Olympic Boulevard, a distance of 5.5 miles from the civic center, and extends southeasterly approximately five miles to the Rio Hondo River. The routing of the freeway and necessary access restriction through this area resulted in a number of existing streets becoming frontage roads adjacent to the new freeway.

> Property owners acclaim Santa Ana Freeway an advantage to industrial business

PREVIOUS STUDY

The recently completed economic study entitled "Industry and Freeways" † has shown that a freeway in a metropolitan area stimulates the development of land within its zone of influence. The study firmly established that the economic effect of a freeway route upon industry is beneficial. The scope of that study, for practical reasons, did not include frontage road influence because the importance of that subject warrants a separate study.

The land abutting a frontage road is more directly affected by the freeway than any other property within the entire freeway zone of influence. The Santa Ana Freeway provides the ideal situation for determining the effect of property values on industrial land abutting a frontage road. Along this freeway there are examples of streets which were more than 50 percent improved before construction of the freeway and due to access requirements became frontage roads; there



Map of Los Angeles showing principal highway routes. Downtown Los Angeles and Test Areas "A," "B," and "C" along Santa Ana Freeway are indicated.

* Data from Monthly Summary Business Conditions in Southern California by Security-First National Bank of Los Angeles.

† May-June, 1954, issue of *California Highways and Public Works* magazine.

are examples of frontage roads in which all of the industrial sites average approximately one acre in size; and there are those frontage roads which have substantially large industrial sites to attract an altogether different type of industrial enterprise. The many variations found along this freeway have made it possible to conduct an economic study covering practically every type of industrial enterprise.

TEST AREAS

In order to find the answer as to the economic effect of a frontage road upon different types of industries on parcels of land varying in size, three different sections of frontage road along the Santa Ana Freeway have been studied as typical examples. They are referred to as Test Areas "A," "B" and "C." The *map of Los Angeles* shows location of these test areas on the Santa Ana Freeway.

The two principal means used to determine whether it is an advantage or a disadvantage for industrial property to be located on a frontage road have been (1) the trend in land values and (2) the statements by the property owners of how they feel about this particular type of industrial site.

The basis of the land trend analysis has been the comparison of land sales on the frontage roads with the sale of other industrial properties which are comparable in every respect except for being located on a conventional road and away from direct freeway influence.

Statements from the owners and officers of industrial plants located on the frontage roads adjacent to the Santa Ana Freeway provide the answers to the second phase of this study—the opinion of industries that have had experience in conducting business on a frontage road side.

Test Area "A"

Area "A" shown in *Diagram 1 and photos* is a section of Telegraph Road along the northerly side of the freeway extending southeasterly from Olympic Boulevard, a distance of approximately 5,000 feet. This frontage road had previously been an arterial

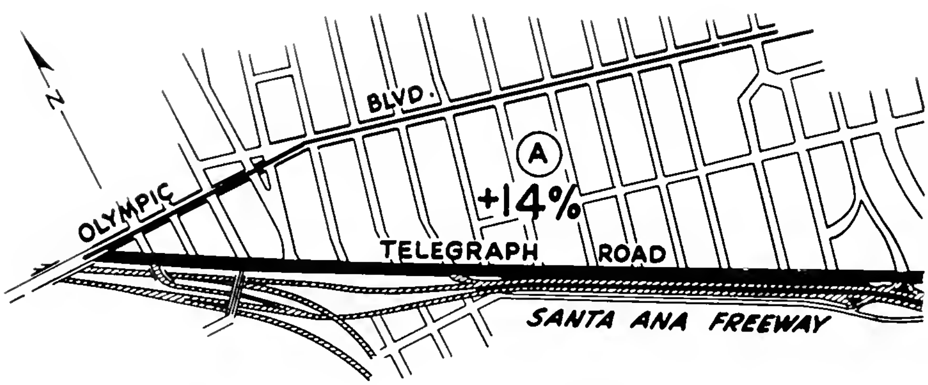


Diagram No. 1

Diagram of Test Area "A" shows frontage road (Telegraph Road) in heavy black line adjacent to freeway. Fourteen percent land value increase over Olympic Boulevard property shown.

thoroughfare with light industrial sites fronting on both sides of the street. The new freeway construction required all of the property on one side of Telegraph Road and the restriction of access rights. This transformation made Telegraph Road into a frontage road with industrial sites along only one side. In order to determine the effect of changing the character of this street, a comparison was made of the trend in land prices with an arterial street which was similarly improved, having the same zoning, and the same general economic influences; the principal difference being that the comparable street removed from the freeway continued as an arterial street and was not converted into a frontage road. Olympic Boulevard shown in *Diagram 1* is the arterial street used for the comparison.

The properties in Test Area "A" are examples of the smallest industrial sites along the freeway. These lots vary in size from 5,000 to 10,000 square feet. In 1949, land value on these two streets was approximately the same. From 1949 to 1954 the market price for industrial lots on both streets increased; however, the gain on the frontage road amounted to 68 percent whereas the arterial street showed an increase of 54 percent. The 14 percent difference in the price increase reflects the degree of enhanced land valuation along this frontage road.

Test Area "B"

The frontage road along the Santa Ana Freeway showing the greatest increase in land values between 1947 and the present time is a 2,500-foot section of Telegraph Road on the northeasterly side of the freeway near

LEFT: View of Olympic Boulevard used for comparison in Test Area "A." RIGHT: Test Area "A"—Telegraph Road—shown in right half of photo. Santa Ana Freeway on left side of picture.

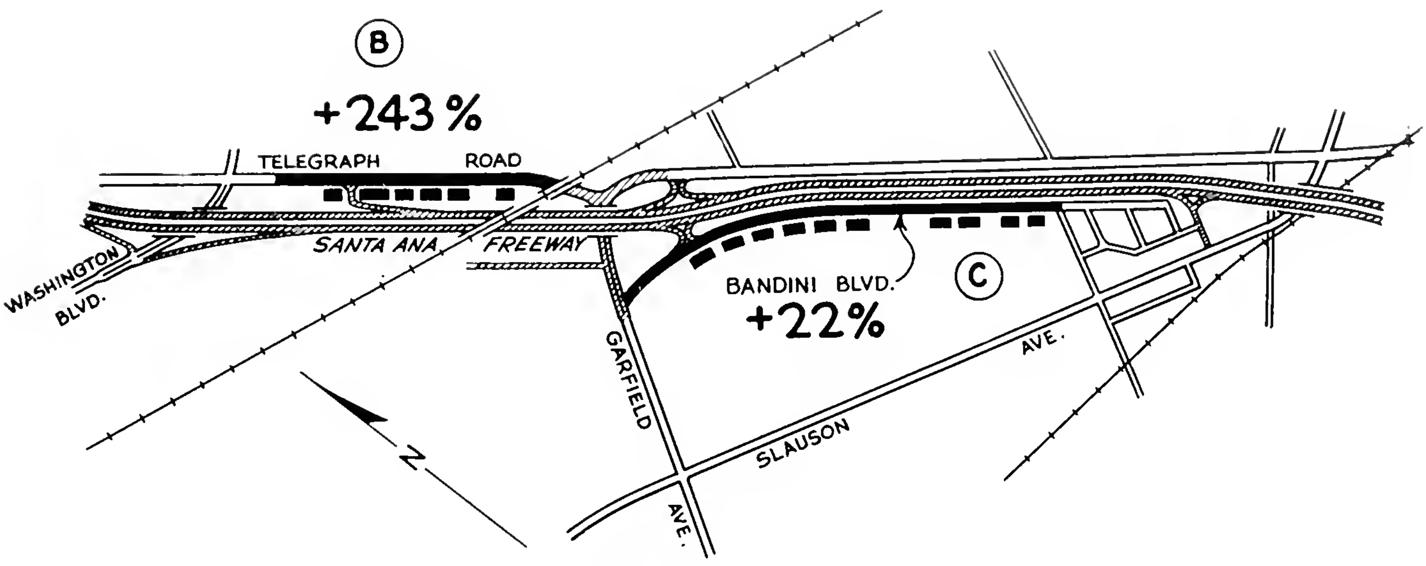


Diagram No. 2

Telegraph Road shown by heavy black line in left half of diagram shows location of Test Area "B." Black squares indicate location of industrial sites which increased in land value 243 percent over comparable sites. Test Area "C" shown in right half of diagram.

Washington Boulevard. Test Area "B" is shown in *Diagram 2* and *photos*. Industrial sites between the freeway and Telegraph Road vary in size from one-half to three acres. These properties sold in 1947 at figures averaging $7,800 per acre. The prices increased to an average of $25,000 per acre in 1953, and the latest sale in 1954 was $55,000 for a one-acre industrial site. These increases represent a 605 percent change in land value for industrial sites in Test Area "B." Comparable size industrial properties having similar characteristics to those on the frontage road, except that they are located some distance from the freeway, have shown a 360 percent increase during the same period of time. The differences in the land value change between 1947 and 1954 was 243 percent greater for the properties in Area "B," as shown in *Diagram 2*.

Test Area "C"

Bandini Boulevard along the southwesterly side of the freeway extends a distance of approximately one mile south from the freeway ramps at Garfield Avenue. Investigation of nine sales of industrial properties along this frontage road between 1946 and 1954 has shown a land price increase of 312 percent. During the same period of time there was a 290 percent increase in land value of comparable industrial property located away from the direct influence of the freeway. The parcels in Test Area "C" were substantially larger than the industrial sites in the other test areas. The size of the parcels which sold on Bandini Boulevard average 2½ acres each.

The industrial property on Bandini Boulevard has shown a 22 percent greater land value increase than the property used for comparative purposes. *Diagram 2* and *photos* show the industry on this frontage road.

LARGE INVESTMENT

The new 15-million-dollar West Coast Branch of Lever Brothers Manufacturing Company has been constructed adjacent to the Santa Ana Freeway in the vicinity of this economic study. The size of this development places it beyond the realm of the normal industrial enterprise used for comparative purposes; therefore, it has not been included in a test area. However, an economic study of industry along the Santa Ana Freeway cannot overlook such a spectacular development.

The 30½-acre site for this plant was acquired in 1949 at a price of $9,000 per acre. The value of this land today, based upon current sales of comparable properties along the Santa Ana Freeway, has been appraised at $25,000 per acre. The design for the Santa Ana Freeway adjacent to this property was known at the time the land was acquired for this plant.

An investment of 15 million dollars by this world-wide organization on an industrial site located at the end of a cul de sac street adjacent to a freeway, and a distance of 2,000 feet from the nearest intersecting street, is noteworthy of everyone's attention.

OWNERS' STATEMENTS

The statements made by owners and officers of industries located adjacent to the Santa Ana Freeway in Los Angeles were confirmed through correspondence during the months of May and June, 1954. All of the industries are engaged in manufacturing, rebuilding, and servicing industrial goods. These industries reporting their opinions of the Santa Ana Freeway make commercial deliveries or pickups throughout the Los Angeles area in conducting normal business operations. The majority of these industrial plants perform their work without any railroad facility adjacent to the plant site. The industries fronting on that section of Bandini Boulevard adjacent to the freeway and the majority of the industries located between

UPPER: Test Area "B." New industrial plants adjacent to Santa Ana Freeway. LOWER: Typical industrial plant in Test Area "B." Freeway exit indicated in left section of photo.

Telegraph Road and the freeway selected their plant sites anticipating the freeway and prior to the opening of that section of the Santa Ana Freeway in the vicinity of their particular industries. The remarks have come from industries varying in size from those having as few as three employees to industries which engage as many as 300.

Excerpts from the individual letters reveal principal thoughts and remarks of the individual industries in their attitude of how a frontage road site adjacent to a freeway can affect the operation of an industrial enterprise.

Parker Engineering Co. & Parker Brothers, Inc., 7044 Bandini Boulevard

The Parker Engineering Company is engaged in applying corrosion resistant coatings to metal products. The distance from this industry to the nearest exit and entrance to the freeway is approximately 350 feet. According to the vice president, this company is very enthusiastic about their location adjacent to the freeway and says "anyone in industry should find it a definite advantage." The principal influencing factors of the freeway reported by the Parker Engineering Company were as follows:

1. Freeway makes it possible to direct traffic to the plant without getting lost. If motorists read freeway directional signs there is no problem in reaching the plant site via the frontage road.
2. Very desirable advertising value on the freeway.
3. The freeway has enhanced the value of the investment by several times. Prospects for selling this property indicate a much higher figure at this location than could have been expected if the property were situated some distance away from the freeway.
4. The Parker Engineering Company is "100 percent sold" on an industrial location adjacent to a freeway. If it were necessary to move, a site would be selected adjacent to a freeway.

Challenge Manufacturing Co., 7400 Bandini Boulevard

This firm manufactures transit-mix concrete mixers. Having outgrown its plant in the Maywood area, it purchased 4.25 acres on Bandini Boulevard in 1950 in order to build a new plant which would accommodate the business expansion. The new site was acquired with full knowledge of the proposed freeway and the fact that Bandini Boulevard in front of the new industrial plant would assume the characteristics of a frontage road. The distance from this industrial site to the Garfield Avenue entrance and exit to the freeway is approximately 2,300 feet. Since the opening of the freeway to traffic in front of this property in the early summer of 1953, this industry finds the new freeway a "tremendous asset" in the operation of their plant. The president of this firm

UPPER: Test Area "C"—Bandini Boulevard—shown in right half of photo. Garfield Avenue exit and entrance to freeway shown in foreground. LOWER: One of the industries in Test Area "C" shown opposite freeway ramp into Bandini Boulevard.

further stated specific advantages brought about by the new freeway:

1. Better employee commuting.
2. Customers and business associates can more easily locate their business adjacent to the freeway.
3. Better circulation and distribution of goods. Travel time to the San Fernando Valley is now approximately one-half hour, whereas it had been nearly 1½ hours before the freeways were constructed.
4. Enhanced property values by freeway location.
5. It is our opinion that the industrial sites adjacent to the freeway (on the frontage road) in the vicinity of our plant are

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Long Beach Freeway

What Is Happening On This Huge Project

By E. T. TELFORD, District Engineer

Television and radio newscasts have accustomed us to getting quick information from reporters on the spot who, being at the scene of action, can give us a firsthand graphic picture of what is happening. In presenting this progress report of the Long Beach Freeway, a similar procedure is being followed of having write-ups from several of the State Division of Highways representatives, each about his own particular job, the resident engineers, the supervising designer, and the senior right-of-way agent—all of whom are in direct responsible charge of various activities on the six-lane Long Beach Freeway. There is also included a write-up by the city engineer of Long Beach covering construction by the City of Long Beach on the Long Beach Freeway southerly of the south terminus of this freeway for the portion where it is not on the State Highway System.

This freeway for many years was called the "*Los Angeles River Freeway*," taking this name from the fact that the major portion of its 16-mile length from the southerly terminus at Pacific Coast Highway to junction with the Santa Ana Freeway follows along the banks of the Los Angeles River. By official action some time ago the Los Angeles County Board of Supervisors changed the name of this freeway to the *Long Beach Freeway*. If one considers the time of first inception, the early planning, the setting aside of vacant lands for freeway right of way years ago by the City of Long Beach and the County of Los Angeles, then the Long Beach Freeway is as old as, if not older than, any of the freeways in the Los Angeles metropolitan area.

Up-to-Date Report

This progress report that is now being made is from the standpoint of describing and discussing current happenings. To those who may wish detailed information concerning what has been done on the Long Beach Freeway in past years, reference can be made to the bibliography at the end of this report.

A full and complete, up-to-date report is now very much in order on this freeway because of the present intensive right-of-way acquisition and construction program that is in progress. The State Division of Highways has spent or obligated for rights of way and for construction a total of \$30,000,000 on this freeway.

Outlook for Future

We are well justified in having an optimistic outlook regarding the Long Beach Freeway and looking forward to completion of the entire 16 miles between Pacific Coast Highway and the Santa Ana Freeway in the not-too-far-distant future. Completed construction amounts to \$2,500,000 and the total of contracts now under way is \$10,500,000.

While some advantage is being obtained from the completed 2½-mile section of the Long Beach Freeway at the southerly end which is now opened to traffic, full benefit to the

Looking northerly from Pacific Coast Highway along completed section of Long Beach Freeway. Two and one-half miles of this completed construction extends to 223d Street.

traveling public in the East Los Angeles and Long Beach areas, and the needed relief to the congested traffic conditions on Atlantic Boulevard will not, of course, be achieved until the Long Beach Freeway is completed throughout. The date of completion cannot be forecast at this time.

The design and the preparation of contract plans for the Long Beach Freeway as described by Mr. Hanson, and the right-of-way acquisition program as described by Mr. Friel, are well advanced. The rate of future progress will depend on the availability of construction funds.

Second Major Link

By H. F. MEINKE, Resident Engineer

On December 15, 1953, the contract for the construction of the second major link of the Long Beach Freeway was approved and awarded to Ukropina, Polich & Kral of San Gabriel at a bid price of approximately two and three-quarter million dollars.

The project for the most part traverses farming land, which is rapidly being developed into industrial sites, adjacent to the westerly levee of the Los Angeles River, starting at 223d Street and terminating at the south junction of Atlantic Avenue. The over-all length is approximately four and one-half miles, which includes a contract now being carried out by Webb & White of Los Angeles, of approximately seven-tenths of a mile in the vicinity of Dominguez Street.

The roadwork, in general, consists of constructing a graded roadbed; surfacing with portland cement concrete pavement on cement treated subgrade over imported base material; placing plant-mixed surfacing on shoulders; constructing accelerating and decelerating lanes and interchange roadways, and surfacing them with plant-mixed surfacing on untreated rock base over imported base and subbase material.

Five Bridges

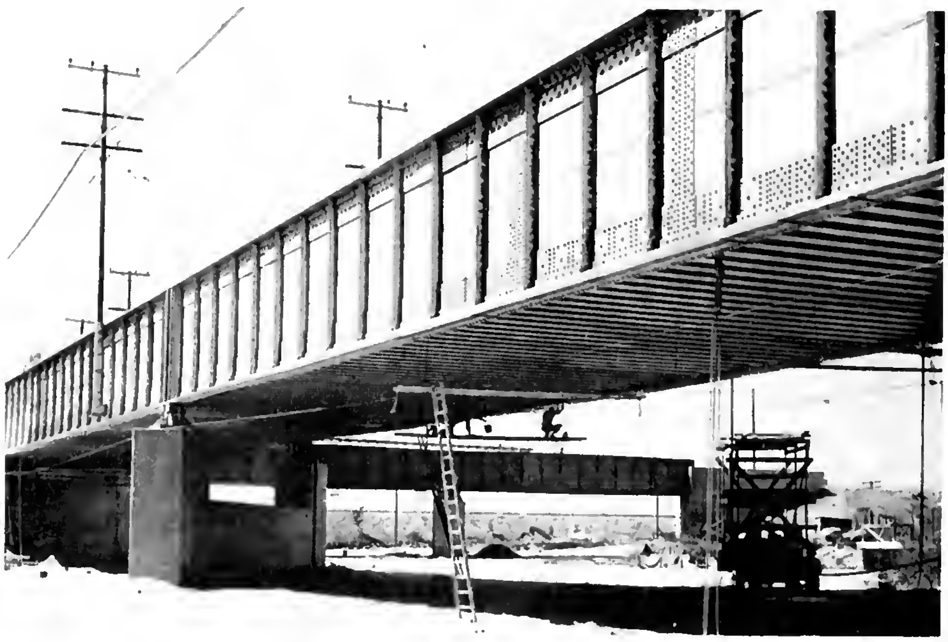
On the Ukropina, Polich & Kral contract there are five bridges, the principal one being a reinforced concrete girder bridge over Atlantic Avenue, composed of two adjacent structures, each structure consisting of one span of about 95 feet, supported by reinforced concrete abutments on concrete piles. The other four bridges are utility undercrossings, two of them under the freeway and two under traffic interchange ramps. All of the bridge inspection and engineering was handled by the Bridge Department representative, Irwin Black, and his two assistants.

Although the roadway excavation quantity totals nearly a quarter of a million cubic yards, an additional half million cubic yards of imported borrow was required to complete the embankments. The contractor arranged with the Dominguez Estates people to obtain this borrow deficiency from a site in the Dominguez Hills west of Alameda Street, approximately one and one-half miles from the project. After getting off to a slow start, the contractor managed to develop a very efficient load and haul operation. The material was loaded with a Sierra loader and hauled by bottom dump truck and trailer units, and truck and semitrailer units. The pit, being comparatively flat and sufficiently long, lent itself to this type of load and haul operation, which resulted in an average daily haul of approximately eight thousand tons. However, all was not "peaches and cream," as the contractor discovered in trying to compact the imported borrow which, for the most part, contained over 50 percent silt. It was necessary to employ as many as seven heavy sheepsfoot tampers at one time on a single fill to insure proper mixing with water and satisfactory compaction.

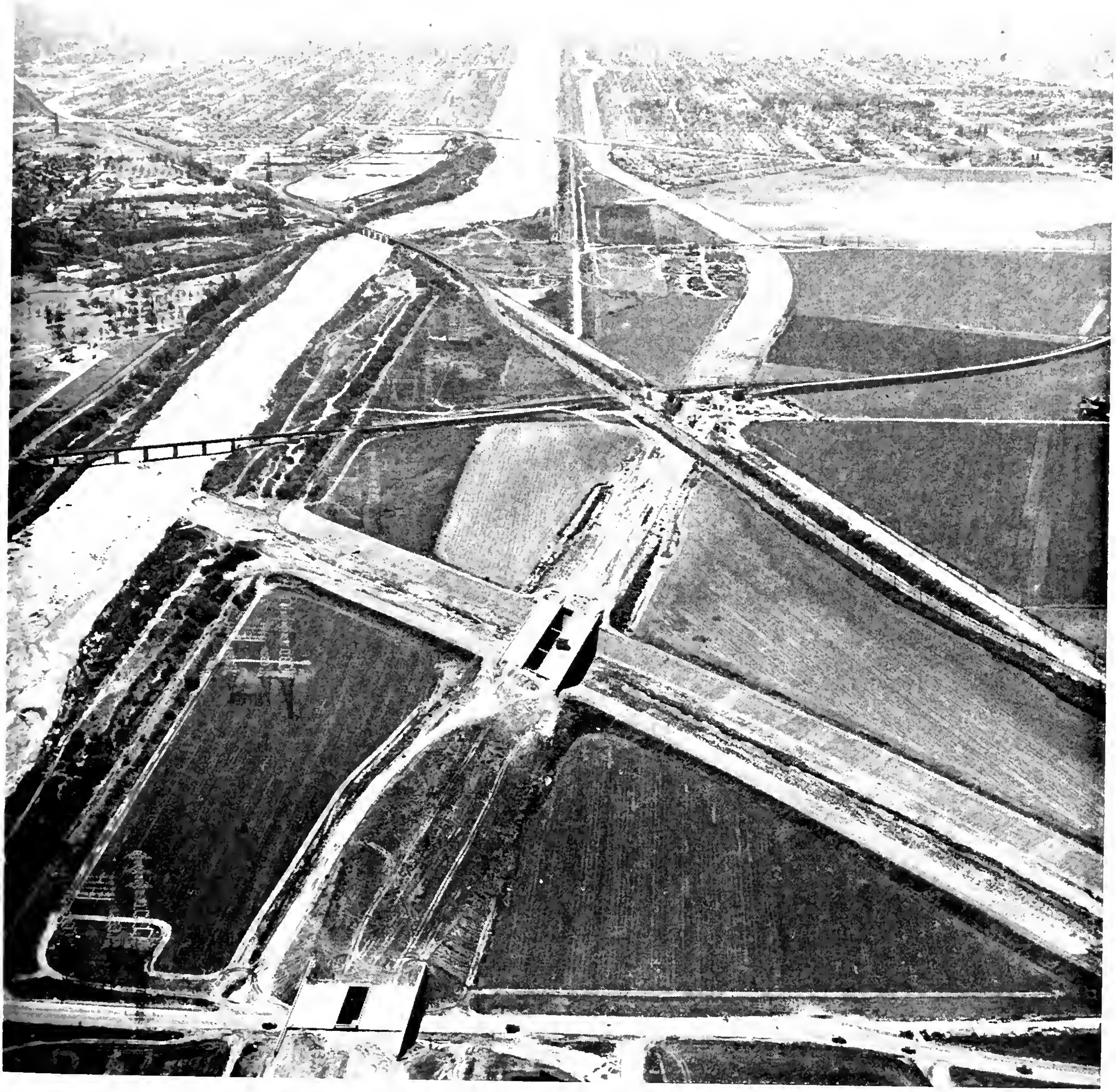
Paving Operation

The other major operation, with respect to cost, was the portland cement concrete pavement, which amounted to nearly 35,000 cubic yards and has only recently been completed. The average daily pour exceeded 900 cubic yards. This high production rate and the low slump concrete used made it difficult for the original tamping machine to do a satisfactory job. To overcome this difficulty, the contractor's mechanic installed a positive acting tamper board. This proved to be far superior to the ordinary tamper and aided the finishing operation by forcing the large aggregate well below the surface of the pavement. The contractor was able to save financially by this for the reason that he did not have to replace the boards on the Johnson float so frequently as he had been doing.

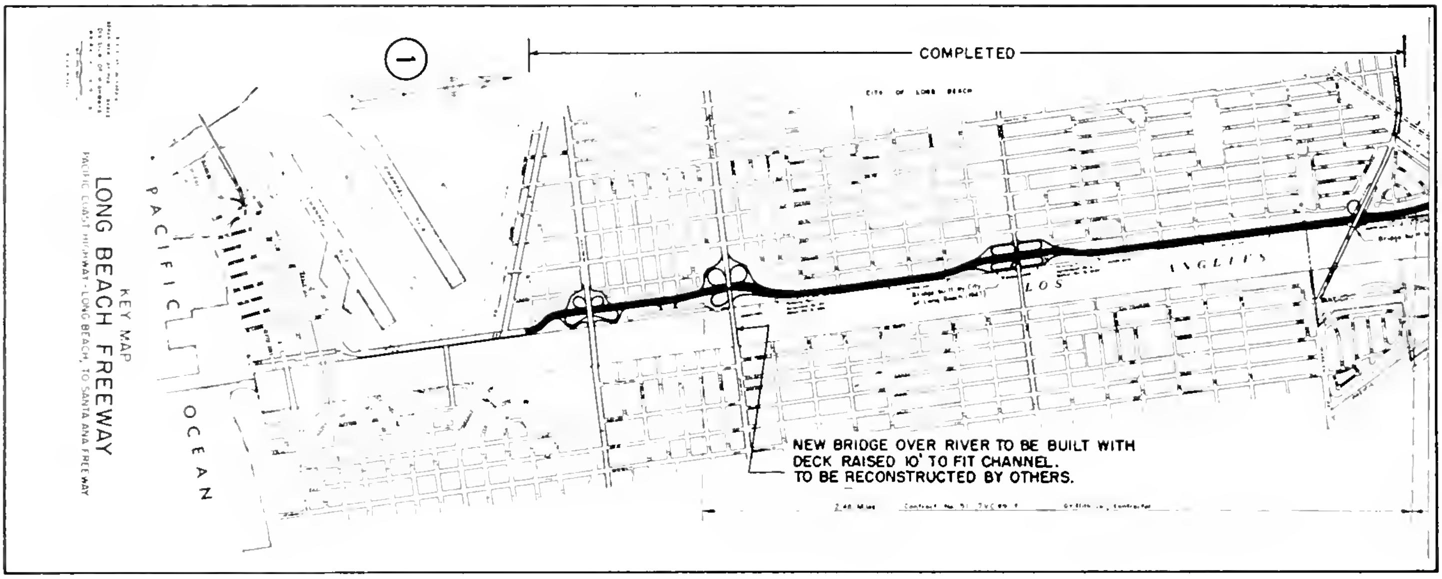
One might think that when the paving is done, the job is practically com-



Looking southerly along Long Beach Freeway showing in foreground bridge nearing completion for grade separation with Pacific Electric Railway and in background grade separation bridge for Union Pacific Railroad. In background is shown the Union Pacific "shoofly." This railroad detour will be removed and material placed in roadway embankment nearby on freeway.



Aerial view looking southerly along the Long Beach Freeway, showing Los Angeles River on left, Del Amo Bridge in foreground, Compton Creek Bridge next, and the railroad grade separation bridges with Pacific Electric Railway and Union Pacific Railroad at Dominguez Street in center of photograph. In background is completed portion of Long Beach Freeway in use by public from Willow Street to Anaheim Street in City of Long Beach. Long Beach harbor in background.



plete; however, this is not quite the picture, as there still remain 14 traffic interchange ramps on which curbs, gutters and plant-mixed surfacing must be placed, in addition to numerous other minor but time-consuming items of work to be completed.

However, barring any unforeseen delays, the people in the Long Beach area should be able to visit their friends and relatives to the north on Christmas of this year via the Long Beach Freeway, being able to travel eight miles of completed freeway from Anaheim Street on the south to the south junction of Atlantic Avenue in Compton on the north.

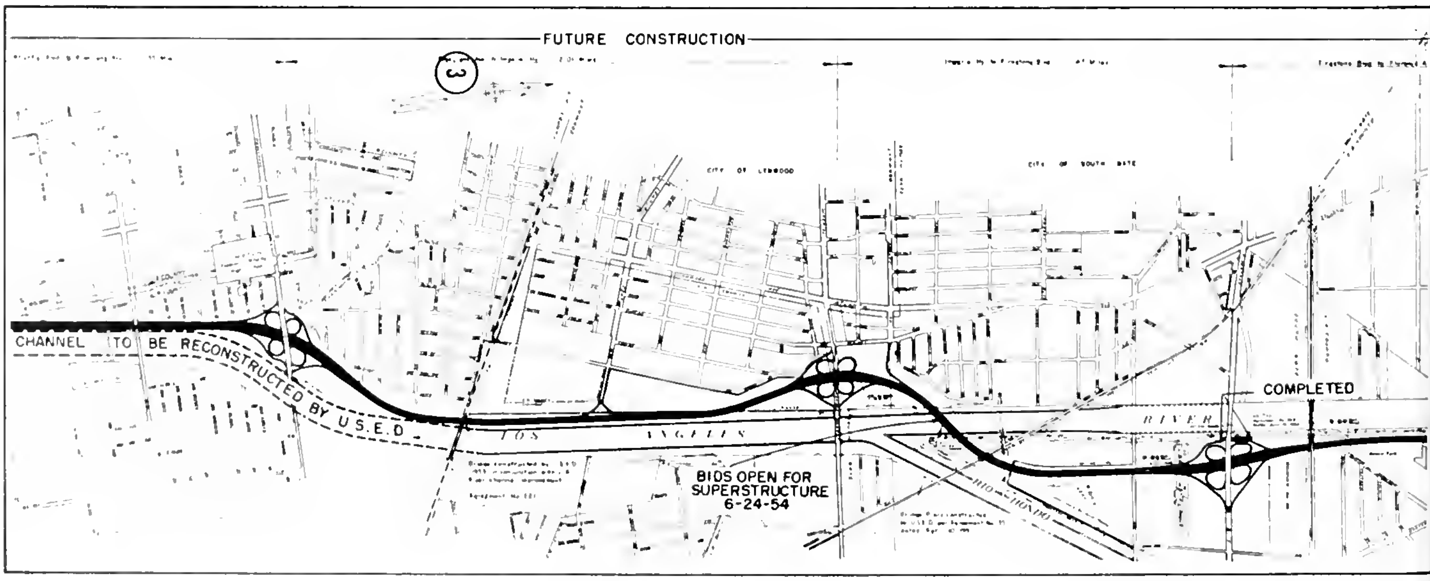
Dominguez Street Underpass

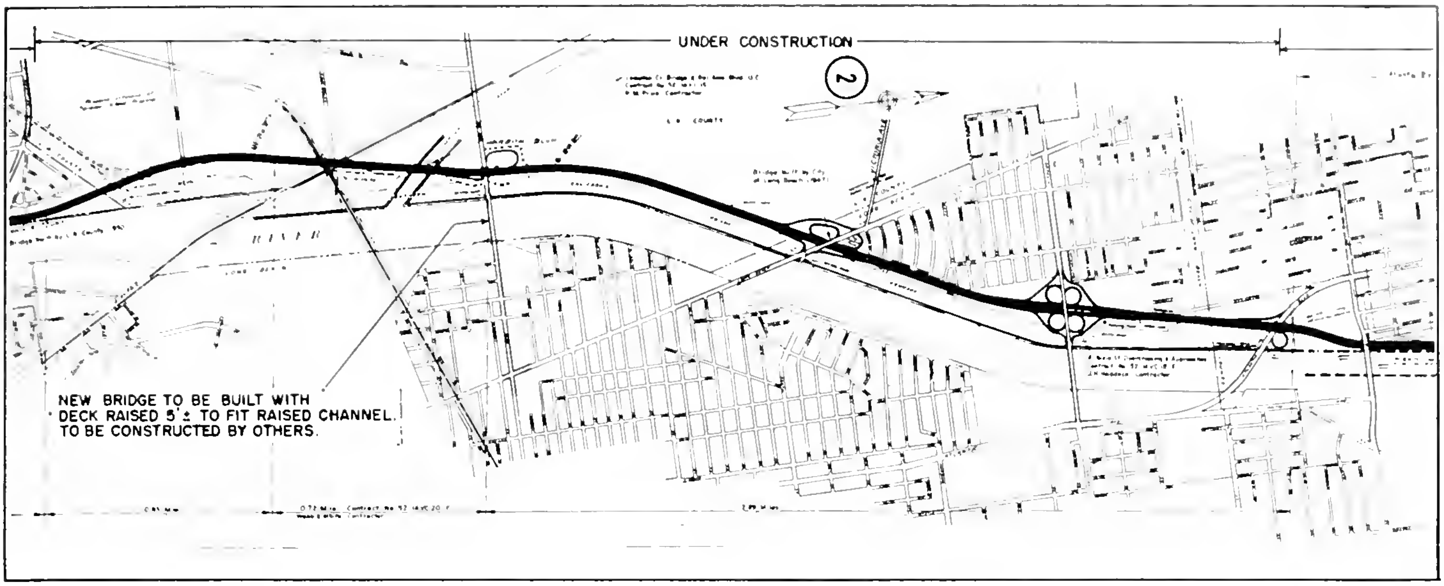
By FRED H. BUCK, Resident Engineer

One of the interesting and difficult problems faced by Contractors Webb and White, during the construction of the Dominguez Street Underpass on the Long Beach Freeway was the fabrication, shipment and erection of the large steel plate girders which carry the double tracks of the Pacific Electric Railway over the freeway in the North Long Beach area.

These girders are among the largest of this type ever fabricated and erected in the Southern California area. As delivered in the field, each of the girders had a weight of 117 tons, a length of 128 feet and a depth of 13 feet. Fabrication was in the Baldwin Park plant of the steel division of the Vinnell Company, Inc. Because of the difficulty of obtaining plate in large enough sizes for the web, a continuous, automatic, longitudinal weld was placed in each girder for the full length. During fabrication in the shop the work was subjected to continuous inspection by the Material and Research Laboratory of the California Division of Highways, under the supervision of Ross Clinton of the Los Angeles office.

When ready for shipment, each girder was lifted upright from the flat position of the portable cars used dur-





ing assembly in the shop and set on trucking equipment furnished by the Belyea Truck Company. The transport had double dollies between the prime mover and the front of the girder to aid in making turns, and a single dolly at the rear. A total of 58 wheels carried the load. When loaded on the transport, the over-all dimensions were 175 feet in length and 16 feet in height. The move to the job site was made during the early morning hours over a carefully selected route and went off without difficulty.

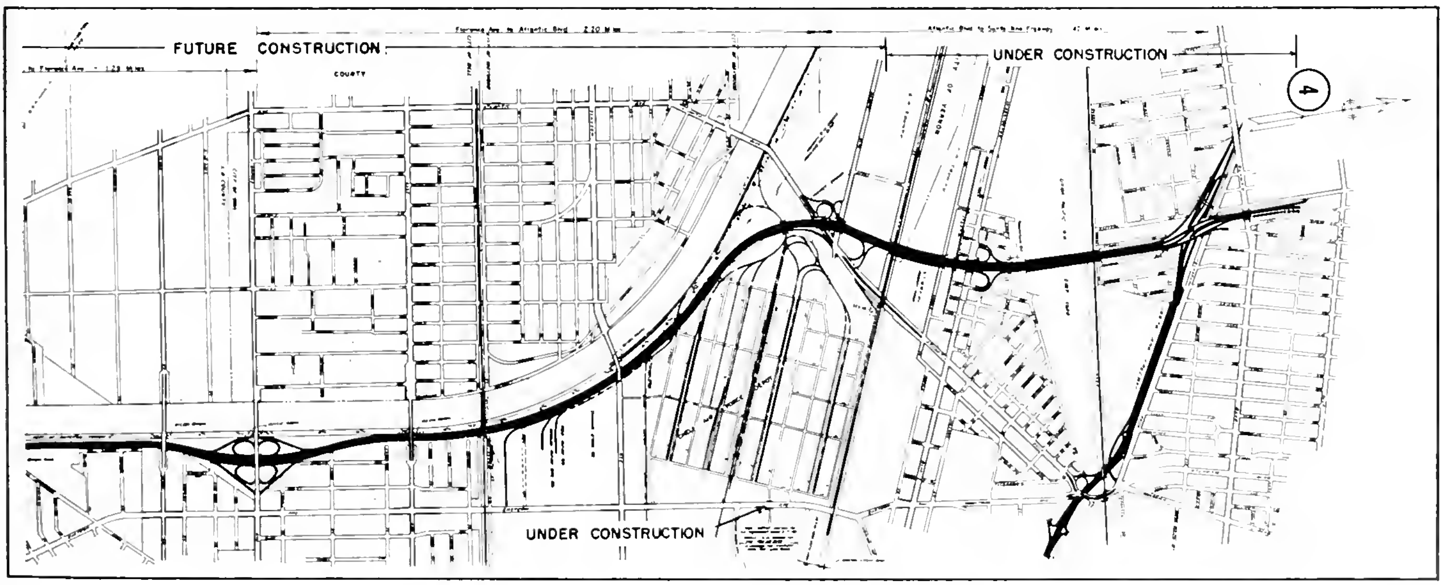
At the erection site, each girder was moved into position as closely as possible, then lifted with four 35-ton cranes, two on each end working through equalizer bars. Before picking up the load, the cranes were spotted so that walking would not be necessary after the girder was taken from the transport. Actual erection went very smoothly, a little over two hours being required to set each girder after it had been spotted in place between the piers. Transportation and erection of the girders was under the supervision of Neil Lang of the Vinnell Company.

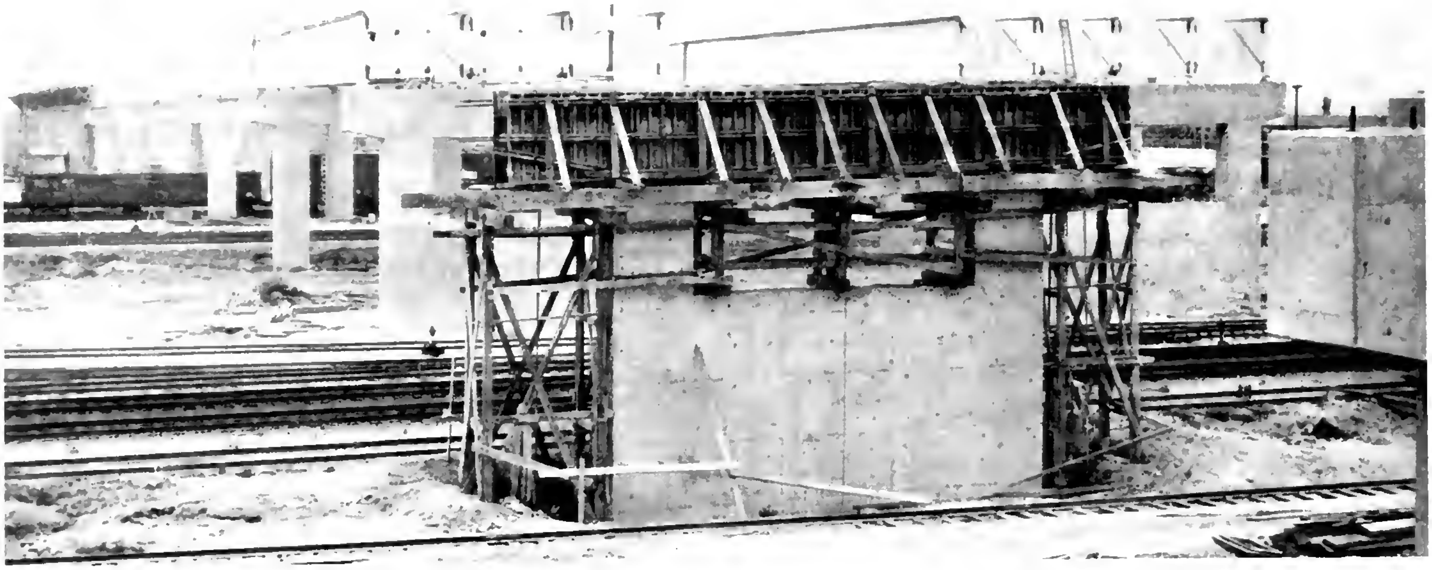
Grade Separations

By A. K. GILBERT, Resident Engineer

Construction under this contract covers two railroad grade separation bridges to carry the Long Beach Freeway over railroad tracks. The smaller structure is called the Pacific Way Overhead and provides a single 20-foot span over Santa Fe Railroad track No. 35. The Pacific Way Overhead, a reinforced concrete rigid frame bridge on concrete drilled piles 30 feet in length, has been completed.

The larger structure is called the Hobart Yard Overhead carrying the freeway over mainline and freight yard tracks of the Santa Fe Railroad. The Hobart Yard Overhead consists of a pair of similar parallel welded structural steel bridges with concrete decks consisting of spans from 50 feet to 117 feet in length having a total length of 1,102 feet supported by reinforced concrete bents and abutments on reinforced concrete piles. The





Construction operations in progress on grade separation structure to carry Long Beach Freeway over the Hobart Yard and mainline track of the Santa Fe Railroad

westerly bridge will provide a roadway uniformly 40 feet wide and the easterly bridge will provide a roadway 40 feet wide at one end and 52 feet wide at the other.

All piers are completed and abutments have been started. Seventy-five percent of the structural steel spans have been erected. Approach fills in connection with this particular job have been completed. They were constructed of imported borrow from the huge excavation being made in the Los Angeles Civic Center for the new Los Angeles County Courthouse. The total amount of imported borrow placed on the approaches was 200,000 tons.

The contract allotment is $1,264,-756.38, and the estimated time of completion, December 1, 1954. The contractor is Ukropina, Polich, Kral, and Ukropina of San Gabriel. The contractor's superintendent is K. Rudolph Brozovich.

Cheli Air Force Depot

By BRUCE GENTRY, Resident Engineer

To acquire the right of way for the portion of the Long Beach Freeway through the Cheli Air Force Depot near the northerly end of the project it was necessary to provide an equivalent area of land in exchange. Land was available adjacent to the east side of the depot but separated from the existing facilities by Eastern Avenue, a heavily traveled county road carrying an estimated 35,000 average daily traffic. A signalized crossing at grade would have introduced an objectionable traffic bottleneck, so it was decided to build a one-lane undercrossing for access to the Cheli Air Force Depot across Eastern Avenue.

The undercrossing structure was designed as a reinforced concrete box, with a 14-foot clear roadway width between curbs and an overhead clearance of 14 feet 6 inches. This structure was positioned to permit approaches on 6 percent grades from existing streets within the base, and consequently projected slightly above the existing profile grade of Eastern Avenue. With the approval of the county road department, Eastern Avenue was raised to cross the structure with a vertical curve, and reinforced concrete retaining walls were designed to limit the necessary fill to the existing right of way.

In conjunction with the Cheli Road Undercrossing, it was necessary to construct drainage facilities including a dewatering pump and a length of 42-inch reinforced concrete pipe culvert to divert the runoff from a large area of the Cheli Air Force Depot which concentrated in the vicinity of the access road. Signals were provided for one-way traffic control through the undercrossing.

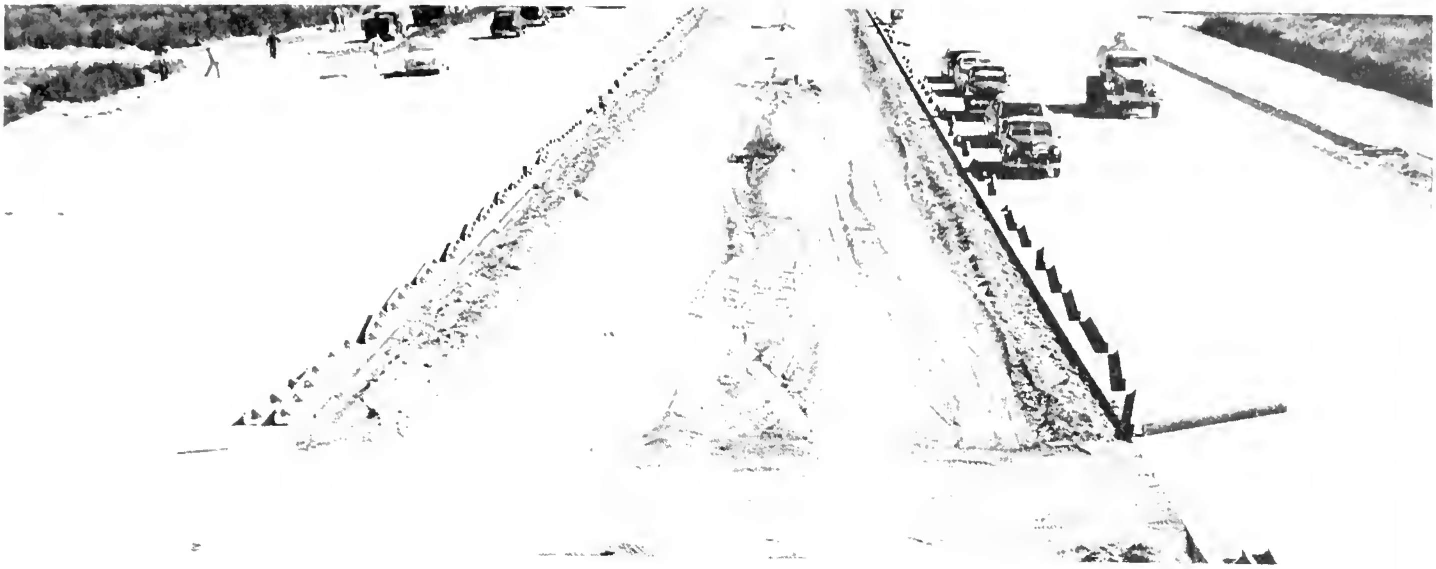
The contractor on this project is N. M. Saliba Company of Gardena. The contract allotment is $140,000 and completion is scheduled for October, 1954. Carl Johnson is the contractor's general superintendent. Joseph Trujillo is the State Division of Highways Bridge Department representative.

East Yard Overhead

By JACK SYLVESTER, Resident Engineer

To carry the Long Beach Freeway at separated grade across Union Pacific Railroad property, East Yard Overhead is under construction. It consists of twin 14-span, simply supported, welded steel plate girder structures of nearly 1,400-foot total length. An accompanying photograph shows a concrete deck placing operation in progress; the contractor is placing the full 40-foot width of deck in one operation, and the finishers' working bridges are seen in the photograph. The strike-off float is seen: it consists of a 5-inch 10-pound "I" beam, 16 feet long, actuated by an electric vibrator.

The bridges are composite structures, requiring the deck slabs to act



UPPER: Looking northerly toward Atlantic Avenue Undercrossing. The pavement on main traffic lanes of freeway has been completed, and construction operations are in progress on the side collector roads and ramps. CENTER: Looking easterly along Dominguez Street showing, on left, steel girders in place for Pacific Electric grade separation and on right steel girders in place for Union Pacific Railroad grade separation. LOWER: Looking southerly along Long Beach Freeway showing the overpass bridge carrying Long Beach Boulevard over the freeway. Northbound on-ramp from Long Beach Boulevard shown on left.

as compression members under live load. Lugs transmitting horizontal shear between the steel plate girders and the deck slab are seen in the same photograph. Or it may be said that the deck slab is not riding as a free passenger on the tops of the steel girders, but is forced to earn its fare by carrying a share of the load. The contractor has adopted the unique method of moving his form and falsework materials ahead on steel roller conveyors—they appear as ladderlike objects in the photograph.

Another photograph shows the space forming the median between the two bridges of the overhead. The double track main line of the railroad appears in the foreground. Eighteen permanent tracks of the railroad are crossed, and East Yard bustles with moving railroad freight equipment at all times. The Union Pacific Railroad has installed the new "pick-a-back" system of moving freight on semitrailers carried by specially fitted flat cars, and it is proving to be a source of considerable business.

J. A. Thompson & Son, of Inglewood, is the contractor on the project, represented by Paul Barnard, Superintendent. Total cost of the job, including railroad work, is expected to amount to about $1,180,000. It is anticipated that the work will be completed about September 15, 1954. It will not be possible to open the overhead to traffic until completion of roadway work under the adjoining contract, upon which Resident Engineer J. M. Curran is reporting.

Freeways Connected

By J. M. CURRAN, Resident Engineer

Bids were received in the District VII office in Los Angeles on June 3, 1954, for the construction of an important section of the Long Beach Freeway between Sheila Street and Verona Street, having a net length of one mile. This construction will provide complete interchange connection between the Long Beach Freeway and the Santa Ana Freeway. It will connect the two railroad grade separations now under construction as described above and will provide completed freeway to a point southerly of Washington Boulevard. In addition to grading and paving the freeway and connecting interchange roadways, this contract provides for the construction of eight bridges. These bridges are located as follows:

Washington Boulevard Undercrossing. This is a reinforced concrete slab and girder bridge, measuring about 101 feet long on centerline of freeway, consisting of two adjacent single-span structures, supported by common reinforced concrete abutments with concrete pile foundations.

Leonis Street Pedestrian Undercrossing. This is a reinforced concrete box, about 239 feet long, providing a clear interior width of 12 feet.

Placing deck slab concrete one span length from east end of Union Pacific Railroad East Yard Overhead

Triggs Street Undercrossing. This is a reinforced concrete slab bridge about 60 feet 4 inches long, composed of one span, supported by reinforced concrete abutments with concrete pile foundations.

Route 167 Westbound Interchange Route 166 Separation. This is a reinforced concrete box girder bridge, about 224 feet long, composed of three spans, supported by reinforced concrete abutments and piers with concrete pile foundations.

Route 167 Northbound Route 166 Separation. This is a reinforced concrete box girder bridge, about 704 feet long, composed of eight spans, supported by reinforced concrete abutments and piers with concrete pile foundations.

Route 167 Southbound Route 166 Separation. This is a reinforced concrete box girder bridge, about 695 feet long, composed of seven spans, supported by reinforced concrete abutments and piers. The abutments and one pier will have concrete pile foundations and the balance of the piers spread footings.

Route 167 Eastbound and Northbound Interchange Route 166 Separation. This is a reinforced concrete box girder bridge, about 459 feet long, composed of six spans, supported by reinforced concrete abutments and piers with concrete pile foundations.

Olympic Boulevard Undercrossing. This is a reinforced concrete box girder, about 97 feet long, composed of one span supported by reinforced concrete pile foundations. The bridge will provide two roadways, each having a minimum clear width of 46 feet between curbs, separated by a 12-foot graded median strip.

The contractor submitting the low bid was B. J. Ukropina, T. P. Polich, Steve Kral, and John R. Ukropina of San Gabriel. The amount of the low bid was $2,447,821.40 and a contract was awarded on June 22d.

The special provision for the contract provides 300 working days from the date of approval of the contract as a time limit for carrying out the construction under this contract.

Status of Design

By E. G. HANSON
Assistant District Engineer

Generally speaking, the design details and preparation of contract plans for the Long Beach Freeway from the Santa Ana Freeway southerly are complete throughout. Design provides for initial consrtuction of a six-lane freeway throughout, with provision being made in design for an ultimate eight-lane width from intersection with the Sepulveda Freeway northerly. However, the setup of future budget limits, when money for construction allocations are made by the State Highway Commission, will often require incidental revisions in the contract plans as finally developed.

Near the northerly end of the project the engineering details of freeway design within the boundaries of the Cheli Air Force Depot are being worked out in cooperation with the U. S. Corps of Engineers under terms of the agreement between the State and the Army.

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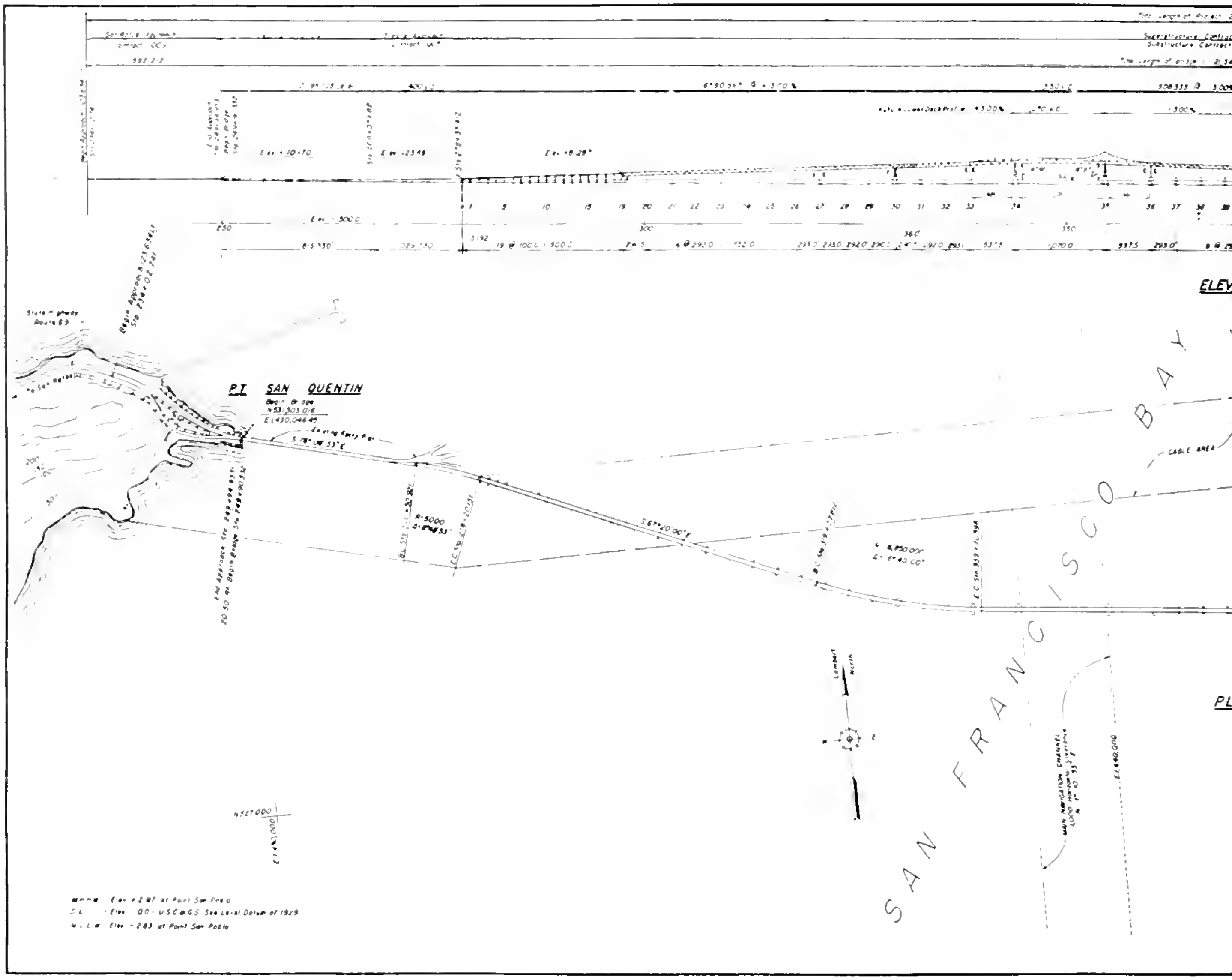
Union Pacific Railroad tracks under East Yard Overhead as viewed from the north abutment of this bridge



General plan and elevation of Richmond-San Rafael Bridge, extending from Pt. San Quenti

Bridge Innovations

Continued from page 15 . . .

per linear foot of bridge. The change, if and when needed in the future, could prolong the useful life of this structure for many years.

During the first few years under traffic it is believed that the toll sergeant, at his desk in the administration building, can direct all operations within the limits of the project and the personnel (toll collectors) under his jurisdiction.

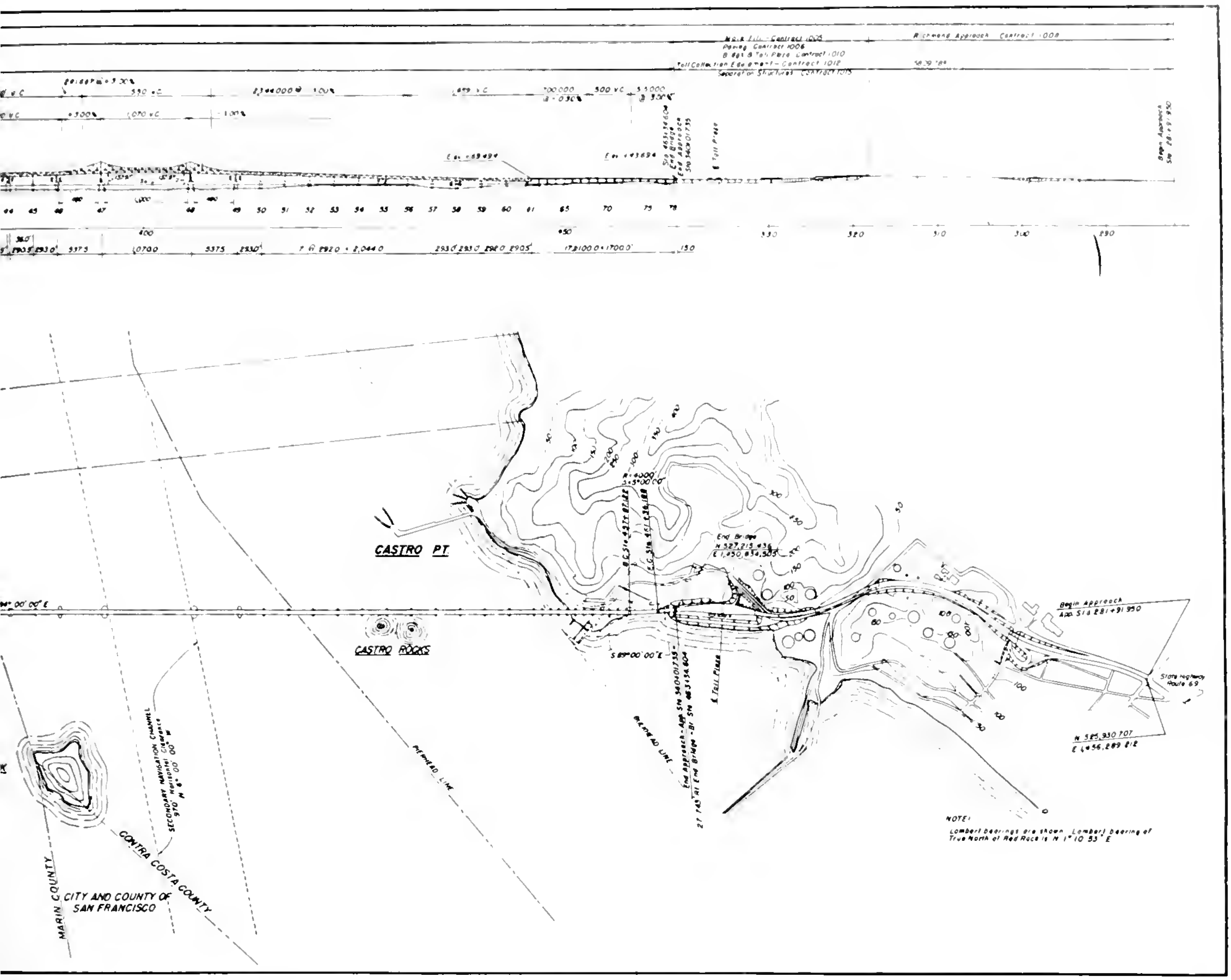
All bridge and outside telephone calls are handled by the toll sergeant. A driver having trouble with his vehicle can signal in from one of the conveniently located fire alarm and tow car service boxes to the sergeant who then notifies the tow or fire truck, by short wave, to proceed to the station from which the call was received.

The sergeant can communicate either by telephone or loud speaker to any of the toll booths. He can also broadcast to any car entering or leaving the toll both from a public address system.

A large control and supervisory panel, having the outline of the bridge etched on the surface and small recessed lights located at proper points, is in full view of the attendant. A failure of a bank of roadway lights is indicated by the proper signal on the panel. A failure of the foghorns is made known by a coded signal, and the failure or change in any of the many electrical devices or circuits is either visually or audibly reported.

Short-wave Radio

During the construction period of the bridge, the short-wave, two-way radio communication system which will eventually be installed on the mobile maintenance equipment is now installed in the division's headquarters in Berkeley, and in the Richmond and San Rafael field offices, for directing operations. Other sets are placed on the floating equipment used in the construction. The survey and triangulation activities are directed by handie-talkies.



County to Pt. Castro in Contra Costa County, construction of which now is 25 percent complete

To permit the bridge to operate efficiently with the minimum of personnel, especially during the early growth of traffic, automatic controls have been widely used. Roadway, aviation, and navigation lighting aids are photoelectrically controlled. Switching devices, protective in nature for the basic electric power distribution, as well as the roadway lighting systems, are relay controlled. Supervising systems (visual, audible, and printed) are indicated to the operator who can direct remote or local action if the necessity arises. In general, an important emphasis has been placed on the devising of efficient means to maintain and operate the Richmond-San Rafael Bridge.

Hawaiian Roads Viewed by Director

A tour of the Island of Oahu to observe roads and road construction was one of the features of a recent trip to Hawaii by Frank B. Durkee, Director of Public Works. Ben E. Nutter, Superintendent of Public Works and Territorial Highway Engineer, conducted Durkee around the island to inspect highway projects, organization and practices.

The territorial highway organization in an endeavor to solve its traffic problems, particularly in the Honolulu area, has an ambitious highway program under way, Durkee reported. A number of projects designed to bring sections of the highway system up to expressway standards similar to those of California are planned or under construction.

Invited by Secretary of the Navy, Charles S. Thomas, to be a civilian guest on the *U.S.S. Yorktown*, Durkee embarked for Hawaii June 30th on the aircraft carrier and returned to Alameda Air Base July 17th on the Navy flying boat Mars.

The purpose of the Secretary's invitation was to afford an opportunity for a representative group of 14 industrial and civic leaders to become

. . . Continued on page 64

State Fair

Hundredth Anniversary Will Be Observed This Year

A FULL CENTURY of faithfully reflecting California's agricultural, industrial and cultural growth will be climaxed September 2d when the California State Fair and Exposition opens its gates for an anniversary celebration with three-quarters of a million guests, most of whom will travel to the big show over new, modern state highways.

From its humble beginning in a Montgomery Street hall in San Francisco in 1854, when many of the exhibits failed to arrive on time, the State Fair has developed into a many-faceted exposition which can be described only in superlatives.

And directors of the fair expect that the 1954 event will be a fitting climax to its steady growth which has continued in spite of fires, floods and two world wars.

Spectacular Growth

This growth and the spectacular growth and development of the State as a whole will be dramatized on September 2d, opening day. At that time a stainless steel time capsule, filled with microfilms of relics of California's past, its vigorous present, and progress-filled future, will be entombed in a glass covered vault in front of the Counties Building. It will carry stories of the State's achievements in highway construction, in government, engineering, agriculture, fine arts, education and related fields, with instructions that the capsule be opened by the Governor of California in 2054.

Already nearly 15,000,000 people, or more than the entire present population of the State, have attended this granddaddy of western expositions down through the years. During the 100 years more than $5,000,000 in premiums and purses have been paid to California exhibitors, who last year placed on display some 24,000 separate items. The best of everything grown or manufactured has gravitated to Sacramento for the annual fall event.

Record Horse Racing Purses

This year's fair will be no exception, and even more has been added. One new record already has been broken by the $155,300 posted for horse racing purses. Premiums of $272,911 represent the highest total ever offered by the State Fair. Outstanding judges like Charles Yule of Calgary, Canada, in beef livestock, Phil Wagner of Baltimore in wines, and scores of others from throughout the United States, insure that premium selections will be tops. Innovations in entertainment have been made, including a new headliner every other night at the big night shows in front of the grandstand. A new entertainment addition is the famous "Dancing Waters," a fantasy of lights and flowing water, which will be a free attraction in the Industrial Building.

Three new buildings have been added, including the half-million-dollar foods and hobbies building, facing its twin Industrial Building across the entrance mall. Brand-new buildings for the poultry, and pigeons and rabbits have been erected in the junior division area. An important addition has been built for the Hall of Flowers and outdoor garden area.

Nearly 4,000 square feet of exhibit and aisle space has been added to the Hall of Flowers, and with a new entrance and wider aisles, insure a smoother flow of visitors through the beautiful building which in the past has been crowded and sometimes jammed during heavy days.

Counties Building

In addition to being a spectacular attraction for those interested in everything pertaining to California, the State Fair offers specific items for persons who have less catholic interests. There are the spectacular displays in the Counties Building, where most of the State's counties outdo themselves in presenting the products and attractions for which they are noted. Brilliantly lighted, animated displays made of everything from oranges and grapefruit to pyramids of California wines, and from wheat sheaves to farmers made from pumpkins are arranged in a colorful array of California's agricultural and industrial might.

For flower lovers and amateur gardeners the Hall of Flowers, where one million blooms are arranged among waterfalls, rivulets, fountains and rocky hillsides and glens is a dazzling display. From exotic orchids to ordinary but still beautiful marigolds, California's most beautiful flora never fails to delight fairgoers.

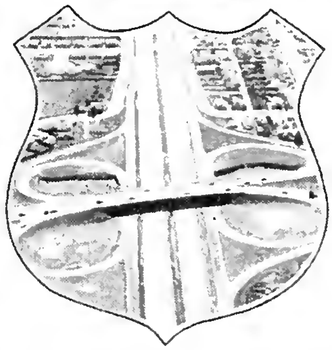
Livestock of dozens of varieties and sizes compete for more than $100,000 in cash premiums, for the benefit of the ranch-minded and not a few city-bred visitors. Future Farmers of America and 4-H Club members make this event the climax of their year as they prepare their prize stock, clothing projects, farm machinery and feature booths for the ribbons and cash. Poultry, pigeons, rabbits, cows, horses, sheep, goats and swine, all registered stock, are on parade for the improvement of their breed in California.

California's oldest continuous horse show, attracting the aristocrats of the equine world, is a favorite of many fairgoers each year. Nine days of horse racing, during which pari-mutuel windows did a $4,000,000 business last year, is another top attraction. Wines, foods, cooking, homemaking, needlework, gadgets, fruits, vegetables, nuts, grains, recreational advantages, fashions, fireworks, free vaudeville shows twice daily, bands, majorettes, clowns, souvenirs all combine into a riot of color, and a tour of California on one 207-acre site.

The driver who races with cars that are trying to pass him on the highway is endangering his own life and the lives of others. When being passed, slow down, pull over to the right a little, and let the other fellow pass.

100th ANNIVERSARY CALIFORNIA STATE FAIR

ALL HIGHWAYS LEAD TO THE FAIR



Carson Pass

Three Projects Improve Sign Route 88

By E. L. TINNEY, District Advance Planning Engineer

Highway 88 is the historic Carson Pass, trans-Sierra route which begins at a junction with US 99 near Stockton and terminates at the Nevada state line east of Woodfords. The route serves the communities of Lockeford, Clements, Ione, Jackson, Pine Grove, and the High Sierra areas between Cook's Station and the Nevada state line, including Silver Lake and Twin Lakes.

The route is the most direct between Stockton and Lake Tahoe, and between Stockton and Nevada. In addition to its recreational potential the route provides an outlet for forest products from the Amador forests to shipping points at Stockton and the Bay area.

One project is currently under construction and two have recently been completed on Highway 88 in San Joaquin and Amador Counties.

The 1953-54 construction program provided for the construction of 6.3 miles in Amador County between Jackson and one mile west of Pine Grove, and 1.4 miles in San Joaquin County between one mile east of Clements and three-fourths mile north of the Mokelumne River.

The 1954-55 program includes a two-mile unit in Amador County between the San Joaquin county line and west of Jackson Creek.

Eliminates Posted Bridge

The first project, between one mile east of Clements and three-fourths mile north of the Mokelumne River, was constructed under contract by Stolte, Inc., and Stephens Trucking Company. The construction provides a 32-foot all-paved roadway section and a reinforced concrete bridge across the Mokelumne River, 28 feet in width and 256 feet in length. This 1.4-mile unit which was completed the latter part of June of 1954, eliminated from the State Highway System a posted bridge across the Mokelumne River and approximately three miles of narrow, winding, obsolete road. A saving in distance of one-half mile resulted between Clements and the easterly end of project.

	Length	PROJECTS RECENTLY COMPLETED OR UNDER WAY	Construction	R/W
X-SJ-97-B	1.4 mi.	Junction Route 24 to ¾ mile north of the Mokelumne River	$244,000	$63,000
X-Ama-97-A	2.0	Amador county line to west of Jackson Creek	155,000	2,000
X-Ama-34-C	6.3	Jackson to west of Pine Grove	764,000	75,000
	9.7 mi.		$1,163,000	$140,000

Construction between Jackson and Pine Grove in Amador County

The second project begins at the San Joaquin-Amador county line, approximately five miles east of the first project.

This two-mile unit was constructed under contract by C. V. Kenworthy at a cost of $155,000. The construction has provided a 32-foot all-paved roadway with 2.5-inch plant-mixed surfacing on cement treated base. This project replaces a narrow, antiquated road which had very restricted sight distance and poor alignment.

The third project begins east of the east city limits of Jackson and terminates one mile west of Pine Grove. This 6.3-mile project will provide a 32-foot all-paved roadway of plant-mixed surfacing on cement treated disintegrated granite. The new alignment being constructed will provide a minimum radius of curvature of 600 feet in contrast to a minimum of 200 feet on the old road. This project eliminates a section of narrow, twisting road.

The project is being constructed under contract by the Clyde Wood Company at a cost of $764,000.

View, south, showing new alignment of Route 97 across Makelumne River and elimination of sharp turn in existing state highway

Project Proposed

In addition to the foregoing projects, Amador County proposes to construct an FAS project between 2.5 miles south of Ione and 2.5 miles southeast of Ione. This construction, while not on the State Highway System, will afford through-Highway 88 users a 3-mile saving in distance. The county proposes to construct the project in two stages:

Stage 1: Grading and drainage in the 1954-55 Fiscal Year.

Stage 2: Base and surfacing in the 1955-56 Fiscal Year.

Grading between Amador County line and two miles easterly

Following is a list of other projects on Highway 88 which have been completed to modern standards in the past 10 years:

Amador County	Miles	Year completed
Through Jackson	1.6	1948
One mile west of Pine Grove to Cook's Station	10.7	1944
Cook's Station to Ham's Station (portions)	3.4	1949
Ham's Station to Lumberyard Ranger Station (U. S. Bureau of Public Roads)	3.9	1952
One mile east of Lumberyard Ranger Station to 1.5 miles east	0.5	1953
Tragedy Springs to Alpine county line (portions)	3.0	1952
Alpine county lint to Carson Pass	5.4	1952
Portions between Pickett's and Woodfords	1.3	1952

Safety Record

Car Drivers of Division Of Highways Commended

By A. I. RIVETT, Safety Engineer

DRIVERS of Division of Highways motor vehicles during the year 1953 drove 97,400 miles for every recordable accident charged against them. Just three years prior, they drove 77,400 per recordable accident. In the year 1953, highway employees improved their driving by traveling 20,000 more miles per recordable accident than they did in 1950—that's an improvement of 26 percent.

Improvement in driving, correction of poor driving habits and the reduction of state-driver accidents are only part of the over-all safety program of the Division of Highways. That program includes industrial and occupational safety and the protection of buildings and properties from fire damage. The motor vehicle safety program, however, is an important segment of the over-all program.

In the last four years, motor vehicle accidents for which Division of Highways employees were considered in whole or in part responsible were reduced 20 percent even though the mileage driven increased nearly 10 percent. In 1950, in 39,500,000 miles of driving, Highway employees had 510 accidents charged to them. In 1953, they drove 43,250,000 miles and had but 444 recordable accidents. Of this 1953 mileage, 19,000,000 miles were driven in passenger cars and 24,000,000 miles in trucks and road building equipment. Some specialized equipment does not carry speedometers. This specialized equipment is not included.

This outstanding achievement is of especial interest since there is no forced driver training program, no charging of employees for the cost of damage to their vehicles occurring during the normal course of employment, no spotters on the road, no candid traffic cameras.

The Division of Highways has more than 9,600 employees. In 1953, 3,500

Testing vision by telebinocular. This instrument tests a driver's visual acuity, depth perception, muscular imbalance and his color vision. LEFT TO RIGHT: Paul O. Harding, Assistant State Highway Engineer, District VII; Carroll T. Berry, Associate, Safety Section; W. L. Fahey, District Engineer, District VII.

DIVISION OF HIGHWAYS VEHICLE ACCIDENTS

Year	1953	1952	1951	1950
Miles traveled	43,250,031	42,793,084	39,658,319	39,480,416
Recordable accidents for vehicles with speedometers	444	515	501	510
Miles driven per recordable accident	97,400	83,100	79,200	77,400

of these employees operated the 3,000 or more pieces of motorized equipment. Most of these drivers have been driving for years. They know how to drive. But, like other drivers, they can fall into bad habits or become overly sure of their driving ability.

Driving Program

Convinced that drivers need to be alerted to their limitations, the Division of Highways Safety Section has developed a program to warn the driver who has not yet had an accident of the possibility of accidents rather than to show the man with an accident record why he has such a record. The program is effective for both.

Through this carefully prepared program, the division has proven the wisdom of the philosophy that if a motor vehicle operator can be shown his weak points, he will learn to compensate for them. And in that knowledge and its application avoidable accidents will be reduced greatly even in the face of the extraordinary high increase of motor vehicle registrations and travel.

In each of the division's 11 districts, on its state-owned toll bridges, in its Headquarters Equipment Department, Materials and Research Department, Bridge Department, and Service and Supply Department—a safety committee of top administrators is responsible to the district engineer or the department head for the safety program.

Safety Committee Duties

Under a directive from State Highway Engineer G. T. McCoy, each district or departmental safety committee must examine and review all the accident reports within its jurisdiction to ascertain that all material facts are contained in the reports and shall decide the basic cause of each accident and determine its recordability.

In the Division of Highways a recordable motor vehicle accident or one charged against the individual's record is an accident which occurred while state equipment was being operated as a motor vehicle and one which could have been prevented or avoided by the driver. The decision as to whether or not an accident is recordable is based solely on whether or not the driver exercised prudent and careful judgment in his attempt to avoid the accident, regardless of any legal rights (such as right of way at intersections) to which he may be entitled under the Vehicle Code. The first consideration is whether the state driver did everything possible to avoid the accident.

The safety committees, in their determination of recordable motor vehicle accidents, may interview the state operators, and always shall advise them as to the committee's decision concerning the recordability of their accidents. The committee in turn may make recommendations to the district engineer or department head and recommend disciplinary action to him when in the judgment of the committee such action is justified.

The safety committee is further directed to carry on an educational program and to do everything in its power to reduce all types of accidents.

Division Safety Committee

At the division level, the State Highway Engineer has appointed a Division Safety Committee to formulate the details of the program within the framework of which the district committees shall operate, to review the monthly reports of the district committees and to advise with the district committees on problems presented, to act as a clearing house for ideas and suggestions which may be incorporated in the program, and to perform the same duties as does the district committee in relation to accidents involving headquarters personnel.

Operational details of the state-wide program are formulated and carried out through Headquarters Safety Section. Headquarters Safety Section is composed of the Safety Engineer, a field assistant, an office assistant, and clerical help. All accidents which occur within the districts are coded and tabulated by Headquarters Safety Section and periodically statistical reports are made and distributed.

To implement the program in the districts, each district has a full-time safety supervisor—the departments have part-time safety supervisors. Safety supervisors are in constant touch with field personnel.

The immediate field effort which we believe is responsible for the fine results achieved in the motor vehicle accident prevention program consists of a series of driver problems given individually. It is our belief that a driver becomes involved in a recordable accident for one of three reasons:

(1) He can't do better. A physical or mental deficiency, temporary or permanent, prevents him from driving more skillfully.

CALIFORNIA AGAIN WINS TRAFFIC SAFETY AWARDS

California's accelerated campaign against traffic accidents has again received national recognition, with Governor Goodwin J. Knight recently accepting five awards for the State's activities during 1953.

In competition with seven other large-population states with major traffic problems, California received first place awards in the fields of traffic engineering, traffic law enforcement, public safety information, and driver licensing, and honorable mention for over-all activities in all phases of traffic accident prevention.

The competition is based on the annual inventory of traffic safety activities conducted by the National Safety Council and various technical and educational organizations.

In the field of traffic engineering, California has now won or tied for first place for four consecutive years.

In accepting the various awards from officials of the National Safety Council and other organizations, Governor Knight commented:

"Naturally, as Californians we are pleased to receive these awards for progressive improvement in the field of traffic safety. However, there is another side to this picture. More than 3,000 persons are killed each year on our streets and highways. The recognition our State has received should serve as added incentive for still greater effort if we are to further reduce the suffering and loss which result from preventable accidents. I urge every public official and every private citizen to intensify efforts to reduce this terrific toll."

The plaques which certify to the various awards were turned over by the Governor to the state agency chiefs concerned.

(2) He doesn't know. He has never taken the trouble to learn the rules of the road nor to acquire the skill needed to be a safe driver.

(3) He doesn't care. He really doesn't want to have an accident but he doesn't care enough not to have one. He is careless, inattentive, reckless, and has a "what the heck" attitude. This driver with a faulty attitude is the least understood and needs the greater attention.

Driver Problems

To meet these individual needs, a series of field problems have been developed for drivers:

(1) A visual problem to determine how well and how much he can see.

(2) A brake reaction problem to determine how quickly he can stop, measured in distance so it is meaningful.

(3) A discussion of traffic laws and the rules of good driving—the Vehicle Code and the "social code."

(4) A demonstration of the individual facts uncovered and their relation to the laws of physics—the inflexible laws of kinetic energy, centrifugal force, friction and gravity. These discussions are emphasized by case histories from our own files and are presented with blackboard diagrams, photographs and demonstrations.

Vision Examination

In the vision problem, we use a Keystone Telebinocular. Although this instrument may be used by professional eye men to furnish diagnostic information, we are using the information obtained only as an indication of the employee's visual acuity, depth perception, muscular imbalance and his color vision. Visual limitations when discovered are pointed out to the employee. In our checks we have found many who could benefit by eye correction. We have so informed them. A large number have obtained needed glasses and we are convinced that employee efficiency has been raised in other activities as well as in motor vehicle operation.

In our visual examinations we have found men who have suppression of vision in one eye and were actually one-eyed when looking with both eyes. This condition caused by the dominant eye doing all the work has been pointed out to the employee who, now being informed, can compensate for this deficiency. Of a special interest has been the observation by drivers, when told that their visual acuity for far distance is poor, that that undoubtedly has been the reason that they did not see the object in the distance which caused a previous accident. It is pointed out that if they cannot read a sign at a distance which will give them an opportunity to follow its instructions a serious accident may ensue.

In addition to these visual checks, drivers are examined for peripheral vision. The lateral field of vision is very important in safe driving. Extreme cases of restricted or narrow field of vision are commonly described as "tunnel vision." Those so afflicted can be taught to turn their head and eyes especially at intersections, to compensate for their restricted field. Rear-view mirrors may also be provided to assist them. Fortunately, less than 1 percent of those checked have been found to have serious restricted side vision.

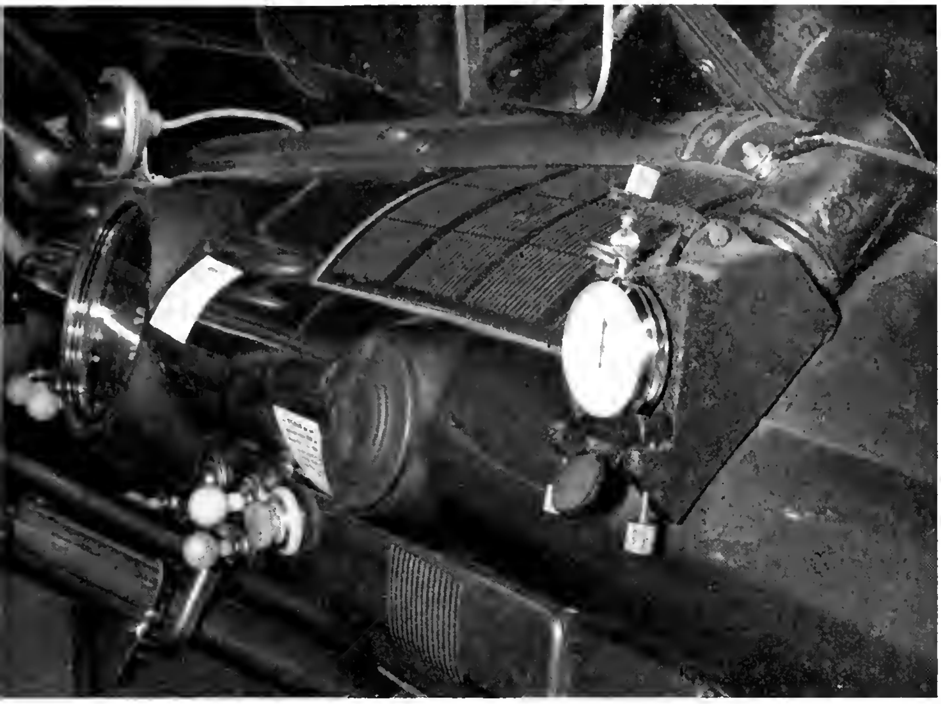
In the braking problem we use both a braking detonator and a simple device for measuring braking reaction with the test car parked.

Before giving this problem, the drivers are asked to make an estimate of the number of feet it will take them to make an emergency stop from a speed of 20 or possibly 30 miles per hour. About 80 percent overestimate their ability. Most of them believe they can "stop on a dime."

Using the bumper mounted brake detonator, the driver is asked to drive his car at speeds of from 15 to 30 miles per hour during which time the driver observer fires the detonator without notice to the driver. This signals the driver to stop and at that instant makes a small paint mark on the pavement. When the brake is applied, another paint spot is made. After the car is stopped, driver and observer measure the distances from the first and second spot to the front bumper. By determining the distance himself, the driver is made aware of the total distance the car traveled before it stopped. In this test, emphasis is placed on braking and reaction distances, rather than time, because drivers cannot picture time in terms of distance.

In many locations where it is not possible to use the conventional reaction braking detonator because of heavy volumes of traffic, a parked car with an electrical timing device developed by members of the Safety Section and Headquarters Shop is used. The car is parked at a convenient location and the driver sits behind the wheel with the observer at his

Double cartridged braking detonator. Using this bumper-mounted brake detonator a driver's reaction time and stopping distance are determined by cartridge fired chalk marks on the pavement.



Division of Highways electrical timing device with parked testing car. By operating a dummy foot throttle and the car brake a driver's reaction time is found in moving his foot from throttle to brake when the red signal light comes on.

right. The driver, back of the wheel, places his right foot at the accelerator position. The regular accelerator has been blocked off and a dummy accelerator is in its place. A push button switch of the type used to raise or lower the headlight beam is on the floorboard under the observer's right foot. Depressing this button actuates simultaneously a stop watch on the dash in front of the observer and a red light also on the dash but in front of the steering wheel. The dummy accelerator must be pressed down and held against a second push button before the watch and light will operate. This assures the observer that normal foot pressure, as in feeding gas to the motor when driving, is duplicated.

The observer may, at any time the accelerator is depressed by the driver, press the foot button which starts the watch and illuminates the red light. When the red light goes on, it is a signal for the operator to transfer his foot from the accelerator to the brake pedal as fast as he can. When the operator hits the brake pedal, another switch attached to the brake pedal stops the watch. His foot reaction time is then recorded from the stopped watch to one-hundredth of a second. This reaction time may be converted to reaction distance for say 30 miles per hour.

Driver Checks Results

Previously to this check, metal markers have been placed ahead of the car at five-foot intervals. The driver, after the car test, is asked to walk ahead of the car and stand at the foot marker that represents his reaction distance. It is pointed out to him that this is the distance that he would have traveled if his vehicle had been going at the speed of 30 miles per hour while transferring his foot from the accelerator to the brake pedal. The observer may use any speed and corresponding reaction distance to illustrate this point. To this reaction time is added the braking distance to determine the total distance required of the average car traveling at the speed under test. The driver then is asked to walk ahead to this total stopping distance so that he can better visualize the entire distance that is required for him to stop his car under speed which he was being tested.

The driver is also reminded that this reaction measurement was made under ideal conditions when he was not actually maneuvering the car in traffic. Under these conditions, there is nothing to divert his attention from the red light. He has no choice of decisions to make. He has only one thing to think about and do, that is to hit the brake when the red light comes on. Under normal driving conditions, his reaction would probably have been much slower and as a result his reaction distance much greater. These reaction time measuring devices are very impressive. Drivers are anxious to try them and are usually much surprised and confess that they were not as good as they thought they were.

Vehicle Code

A true and false quiz is used to determine how much the driver knows of the rules of the road and the Vehicle Code. To answer the questions, any source of information may be used. The papers may even be taken home to be answered. This is not an examination but a means of education. When the questions and answers are returned, the incorrect answers are marked by the district safety supervisor and the quiz returned to the employee with a complete set of correct answers. Not only does the individual gain by this quiz method but the safety supervisor has pointed out to him areas of misinformation or lack of information in which he should spend some effort.

The last problem presented to division drivers is the only one presented in a group meeting. By the use of a blackboard and demonstration equipment, supplemented by audience participation, answers to questions which have arisen through the other problems of the program are discussed and analyzed. Unusual accidents which have occurred to state-owned vehicles are illustrated and an explanation given on what the car driver did that was wrong and what he should have done to avoid the accident. By simple mathematics, very carefully detailed on the blackboard, the laws of physics which apply to moving bodies are explained.

Braking and stopping distances may seem to be familiar terms but when they are explained in terms of deceleration, friction, cohesion or gripping efficiency, velocity, opposite and

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Cost Index

State Highway Construction Costs Continue Downward Trend

RICHARD H. WILSON, Assistant State Highway Engineer
H. C. McCARTY, Office Engineer
JOHN D. GALLAGHER, Assistant Office Engineer

During the second quarter of 1954 contract prices on state highway construction projects continued the downward trend which began in the first quarter. The California Highway Construction Cost Index for the second quarter of the year was 5.2 percent under the first quarter.

Highway construction costs as indicated by the Index were relatively stationary throughout 1953 but during the first quarter of this year dropped 8.0 percent, from 216.7 to 199.4 (1940 = 100). During April, May, and June the 5.2 percent drop was from 199.4 to 189.0, which is a rate of decline about two-thirds that during the first three months of the year. This drop puts the index of highway costs back to approximately where it was in the third quarter of 1950.

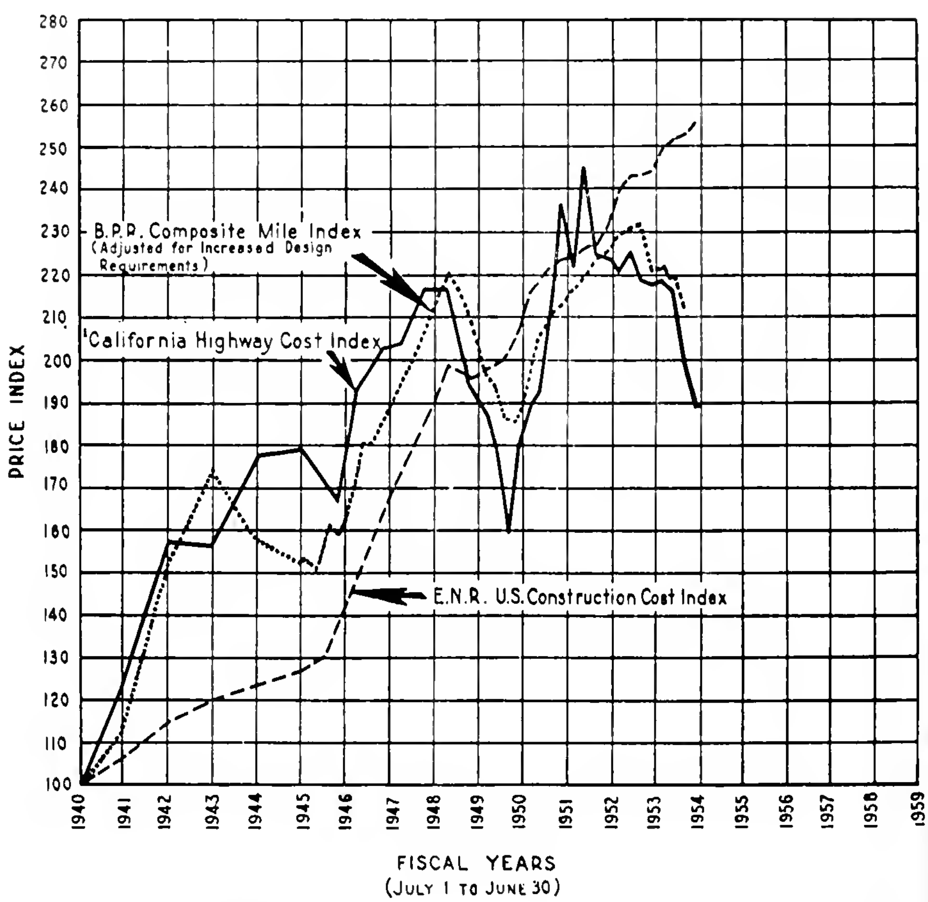
The accompanying tabulation shows the California Highway Construction Cost Index by years from 1940 to 1949 and by quarters from 1950 to 1954.

THE CALIFORNIA HIGHWAY CONSTRUCTION COST INDEX

Year	*Cost index*
1940	100.0
1941	125.0
1942	157.5
1943	156.4
1944	177.8
1945	179.5
1946	179.7
1947	203.3
1948	216.6
1949	190.7
1950 (1st quarter)	160.6
1950 (2d quarter)	180.0
1950 (3d quarter)	189.2
1950 (4th quarter)	194.8
1951 (1st quarter)	215.4
1951 (2d quarter)	238.3
1951 (3d quarter)	221.9
1951 (4th quarter)	245.4
1952 (1st quarter)	224.8
1952 (2d quarter)	224.4
1952 (3d quarter)	221.2
1952 (4th quarter)	226.2
1953 (1st quarter)	218.3
1953 (2d quarter)	217.5
1953 (3d quarter)	218.0
1953 (4th quarter)	216.7
1954 (1st quarter)	199.4
1954 (2d quarter)	189.0

PRICE INDEX CONSTRUCTION COSTS

1940 = 100



This 5.2 percent drop in California highway construction costs during the second quarter of this year confirms our opinion that the 8.0 percent drop in the first quarter marked a definite break in such costs. Competition among bidders for state highway work while lower during April, May, and June than during the first three months of the year still remains at a high level, particularly in view of the unprecedented volume of work for which bids were opened during that period. Accompanying tabulations show the number, size and average number of bidders on state highway projects for the first six months of

1954 and for the fiscal year from July 1, 1953, to June 30, 1954, with summaries of the average number of bidders by months.

The factors which effected the continued decline of bid prices and the continued keen competition among bidders are thought to be the same as were reported for the first quarter of the year: falling off of federal work and scarcity of new work in other branches of construction; willingness or necessity of bidders to lower their prices in order to keep their organizations intact and meet their equipment obligations; and ample availability of materials and equipment. Increased labor productivity in recent months is another factor which is thought to have contributed to the decline in prices.

This downward trend in contract costs is in the face of continued increases to labor in wages and fringe benefits. To offset the increases to labor in both industry and construction there must be the development of increased efficiency and productivity of machinery. During peace times such development makes its greatest advances and it is thought that we may look for greater mechanical improvements during the months ahead. However, it also is believed that increased payments to labor must eventually catch up with contract prices and turn prices again upward. It is expected that the downward trend will continue at least for another quarter or two before a new uptrend begins.

The accompanying tabulation of average contract unit prices for the eight items on which the California Highway Construction Cost Index is based shows these average unit prices by years and quarters since 1940. From this tabulation it will be noted that during the second quarter of 1954 the average bid price for roadway excavation dropped from $0.45 to $0.38 per cubic yard, a decrease of 15.5 percent; untreated rock base dropped 8.3 percent, from $2.28 to $2.09 per ton; portland cement concrete pavement was down 4.1 percent, from $14.89 to $14.28 per cubic yard; and structural steel went down from $0.126 to $0.114 per pound, a drop of 9.4 percent. Three of the eight items showed increases, plant-mixed surfacing rose 1.4 percent, bar reinforcing steel 1.1 percent and asphalt concrete pavement was up 8.3 percent, however, as quantities for this latter item (asphalt concrete) are small in comparison to the other items, fluctuations in its cost do not greatly affect the Index. It would appear that responsibility for the 5.2 percent drop in the Index is in the prime items of roadway excavation, untreated rock base, structural steel and portland cement concrete pavement.

The accompanying chart compares the California Highway Construction Cost Index with the U. S. Bureau of Public Roads Composite Mile Index and the Engineering News-Record Construction Cost Index, all reduced to the base of 1940 = 100. The Bureau of Public Roads Composite Mile

. . . Continued on page 61

NUMBER AND SIZE OF PROJECTS, TOTAL BID VALUES AND AVERAGE NUMBER OF BIDDERS

(January 1, 1954, to June 30, 1954)

Project volume	Up to $50,000	$50,000 to $100,000	$100,000 to $250,000	$250,000 to $500,000	$500,000 to $1,000,000	Over $1,000,000	All Projects
Road projects:							
No. of projects	167	51	46	24	23	7	297
Total value*	$2,971,052	$3,687,802	$7,688,695	$8,444,938	$16,410,375	$15,333,119	$54,535,981
Avg. no. bidders	5.4	6.7	7.7	8.0	9.2	10.1	6.7
Structure projects:							
No. of projects	22	5	3	3	2	2	37
Total value*	$425,893	$322,029	$440,209	$849,747	$1,584,969	$6,642,283	$10,265,130
Ave. no. bidders	7.5	9.8	8.0	14.7	13.0	9.0	8.8
Combination:							
No. of projects						9	9
Total value*						$19,464,822	$19,464,822
Ave. no. bidders						10.9	10.9
Summary:							
No. of projects	199	56	49	27	25	18	343
Total value*	$3,396,945	$4,009,831	$8,128,904	$9,294,685	$17,995,344	$41,440,224	$84,265,933
Ave. no. bidders	5.4	7.0	7.7	8.8	9.5	10.4	7.0

* Bid items only.

Total Average Bidders by Month

	Jan.	Feb.	March	April	May	June
1954	7.6	8.4	8.8	6.9	5.7	6.3
1953	5.5	6.1	7.5	6.4	5.9	6.0

NUMBER AND SIZE OF PROJECTS, TOTAL BID VALUES AND AVERAGE NUMBER OF BIDDERS

(July 1, 1953, to July 1, 1954)

Project volume	Up to $50,000	$50,000 to $100,000	$100,000 to $250,000	$250,000 to $500,000	$500,000 to $1,000,000	Over $1,000,000	All Projects
Road projects:							
No. of projects	281	83	74	45	35	100	528
Total value*	$5,198,555	$5,864,185	$12,211,718	$15,553,979	$23,819,224	$18,998,488	$81,646,149
Ave. no. bidders	5.2	6.9	7.6	8.4	9.3	10.0	6.4
Structural projects:							
No. of projects	43	13	10	9	5	5	85
Total value*	$988,387	$858,769	$1,465,315	$3,203,612	$3,683,561	$12,696,200	$22,895,844
Ave. no. bidders	7.4	9.7	9.6	11.6	10.6	11.2	8.9
Combination:							
No. of projects						16	16
Total value*						$36,373,422	$36,373,422
Ave. no. bidders						10.5	10.5
Summary:							
No. of projects	324	96	84	54	40	121	629
Total value*	$6,186,942	$6,722,954	$13,677,033	$18,757,591	$27,502,785	$68,068,110	$140,915,415
Ave. no. bidders	5.5	7.2	7.9	8.9	9.5	1.9	6.9

* Bid items only.

Total Average Bidders by Month

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	Year
1953-54	6.2	6.9	6.4	7.6	7.4	7.7	7.6	8.4	8.8	6.9	5.7	6.3	6.9
1952-53	4.3	4.3	5.9	5.1	5.9	4.8	5.5	6.1	7.5	6.4	5.9	6.0	5.7

New Bridge

San Lorenzo River Span Is Federal Aid Secondary Project

By CARL R. KING, Design Engineer-Bridges, Santa Cruz County

THE BEAR CREEK ROAD was first surveyed by M. V. Bennett in 1873 for a corporation known as the Bear Creek Toll Road Company. The right of way width was given as 50 feet and the length as approximately 10 miles. The lower portion followed an existing road and was unsurveyed. The road was completed and opened in September, 1876, and this fact was reported to the county supervisors by Wm. Parkhurst, President, and R. W. Craig, Secretary, of the Bear Creek Toll Road Company.

The road was operated as a toll road until some unrecorded date between 1888 and 1890. In 1890 the county accepted a deed for right of way for that portion of the road in lands of McMillan and Harmon who owned a considerable part of the land along the road.

The first complete survey of the road was made in 1921 by Lloyd Bowman, County Surveyor, who relocated a portion of it to improve the grade and reduce the number of bridges.

The road was widened and the surface improved in the period between 1934 and 1940 under the auspices of the WPA.

As presently located the Bear Creek Road starts at the northerly limits of the unincorporated town of Boulder Creek on State Sign Route 9 and traverses easterly and northerly 9.82 miles to State Sign Route 5.

The town of Boulder Creek is located in the heart of the Santa Cruz Redwood country and the San Lorenzo River valley. This general area is becoming increasingly popular as a site for summer homes for residents of the San Francisco Bay region.

In view of the increasing importance of the Bear Creek Road the board of supervisors requested that it be included in the Federal Aid Secondary System. On April 5, 1950, it was accepted as FAS 1172 by the U. S. Commissioner of Public Roads.

The most critical feature of the road was the light truss bridge over the San Lorenzo River and its indirect approach to State Sign Route 9 in Boulder Creek. The bridge was a through Pratt truss, 100 feet long, 19.5 feet between trusses, and of about 1910 vintage and loadings.

It was decided to construct a new bridge and approaches about 250 feet upstream of the existing structure to carry modern highway loadings and to improve the approach to State Sign Route 9. As an FAS project, plans for a continuous three-span bridge with spans of 55, 90, and 70 feet supported on wide flange girders on steel bents with a steel grid deck and 350 feet of approaches were completed.

Negotiations for the two parcels of land required for this project were started during the design of the

UPPER: Old San Lorenzo Bridge on Bear Creek Road in Santa Cruz County near the town of Boulde[r] Creek. LOWER: New San Lorenzo River Bridge constructed by Santa Cruz County under the Federal Ai[d] Secondary Highway Program.

bridge. One parcel was secured without difficulty. The other parcel was held by an absentee owner and had a tax lien by the Collector of Internal Revenue against it. Both the owner and the Collector of Internal Revenue were cooperative, but the necessary three-way correspondence and legal requirements delayed acquisition of this parcel enough to make the original design a Korean War casualty.

In July, 1950, prior to the Korean War price rise, the total cost estimate for the bridge was $66,197. By August the cost estimate climbed to $77,017. In October the estimate was $80,850. By February of 1951 the estimate reached a total of $119,316. The board of supervisors decided the price excessive and in March of 1951 deferred the project indefinitely.

In late 1952 the project was reconsidered and it was decided that a redesign of the bridge would lower the cost to about the original estimate. The proposed redesign was to shorten the structure to three continuous spans of 57, 70, and 50 feet. The deck was to be of reinforced concrete supported by wide flange girders on reinforced concrete bents and abutments. Design loading was to be AASHO H20 - S16 - 44. The width of the deck was to be of 26 feet, with two foot safety curbs on either side and an over-all length of 173.5 feet.

The redesign was completed in the spring of 1953 and plans submitted to the Division of Highways and the Bureau of Public Roads for approval, and awarding of the contract.

The contract was awarded in September, 1953, and construction started in October, 1953. Construction was carried on throughout the winter with little difficulty as all parts of the structure were above high water. The project was completed in March, 1954, at a total contract cost of $56,806.74.

The contractor was Stolte, Inc., of Oakland. Alfred Cantor and T. B. Coull were joint superintendents. Walter I. Nilsson was resident engineer for the County of Santa Cruz. The project was under the supervision of Fred R. Pracht, County Road Commissioner. The writer was responsible for the redesign of the bridge.

Engineers Report to Governor on Bay Crossing

Governor Knight confers with consultants on Southern Crossing. LEFT TO RIGHT: Richard E. Dougherty, New York; Governor Knight; Dean Daniel V. Terrell, Kentucky.

Two of America's most outstanding engineers were selected by Governor Goodwin J. Knight as consultants on a southern crossing of San Francisco Bay.

They are Daniel V. Terrell, President of American Society of Civil Engineers and Dean of the College of Engineering, University of Kentucky, and Richard E. Dougherty, a graduate of Columbia University, with a long record of accomplishments as a consulting engineer and a member of the firm of Seeley, Stephenson, Value-Knecht of New York.

These consulting engineers are shown discussing their findings with Governor Knight. Their report to the Governor stated:

In accordance with your request, we have spent the past several days in a very complete inspection in the field of the proposed southern crossing of San Francisco Bay, as provided for in California Statutes of 1953, Chapter 1056, and have otherwise reviewed the problem at length with the Project Engineer of the Division of San Francisco Bay Toll Crossings, and the Assistant State Highway Engineer in charge of District IV of the Division of Highways, California Department of Public Works.

We believe that the Department of Public Works demonstrated its ability to direct a project such as the southern crossing when it successfully planned and constructed the San Francisco-Oakland Bay Bridge, one of the world's greatest engineering and financial accomplishments. This ability is currently demonstrated by the very satisfactory progress now evident on the Richmond-San Rafael Bridge.

We recommend that the same basic engineering and financial procedure be followed, and that the Department of Public Works continue the work already initiated, for the southern crossing project.

At the appropriate time, an independent board of consultants would be advisable to collaborate with the Department of Public Works and its division in charge of the project, in such manner and under such procedure as may be determined by the Director of Public Works and the California Toll Bridge Authority.

Harbor Freeway

Retaining Walls and Bridge Structures Are Important

By W. A. McINTYRE, Associate Bridge Engineer

In the May-June, 1954, issue of *California Highways and Public Works* was a story on the Harbor Freeway by District Engineer W. L. Fahey. The purpose of this present write-up is to supplement the general information in Mr. Fahey's story and to describe in detail important structures being built under Contract No. 53-7VC60-F. The third section of the Harbor Freeway in the Los Angeles metropolitan area extending from Olympic Boulevard to Flower Street is rapidly nearing completion. Two-thirds of a mile of eight-lane freeway from Olympic Boulevard to Washington Boulevard is now in full operation, having been opened to public traffic on May 14, 1954.

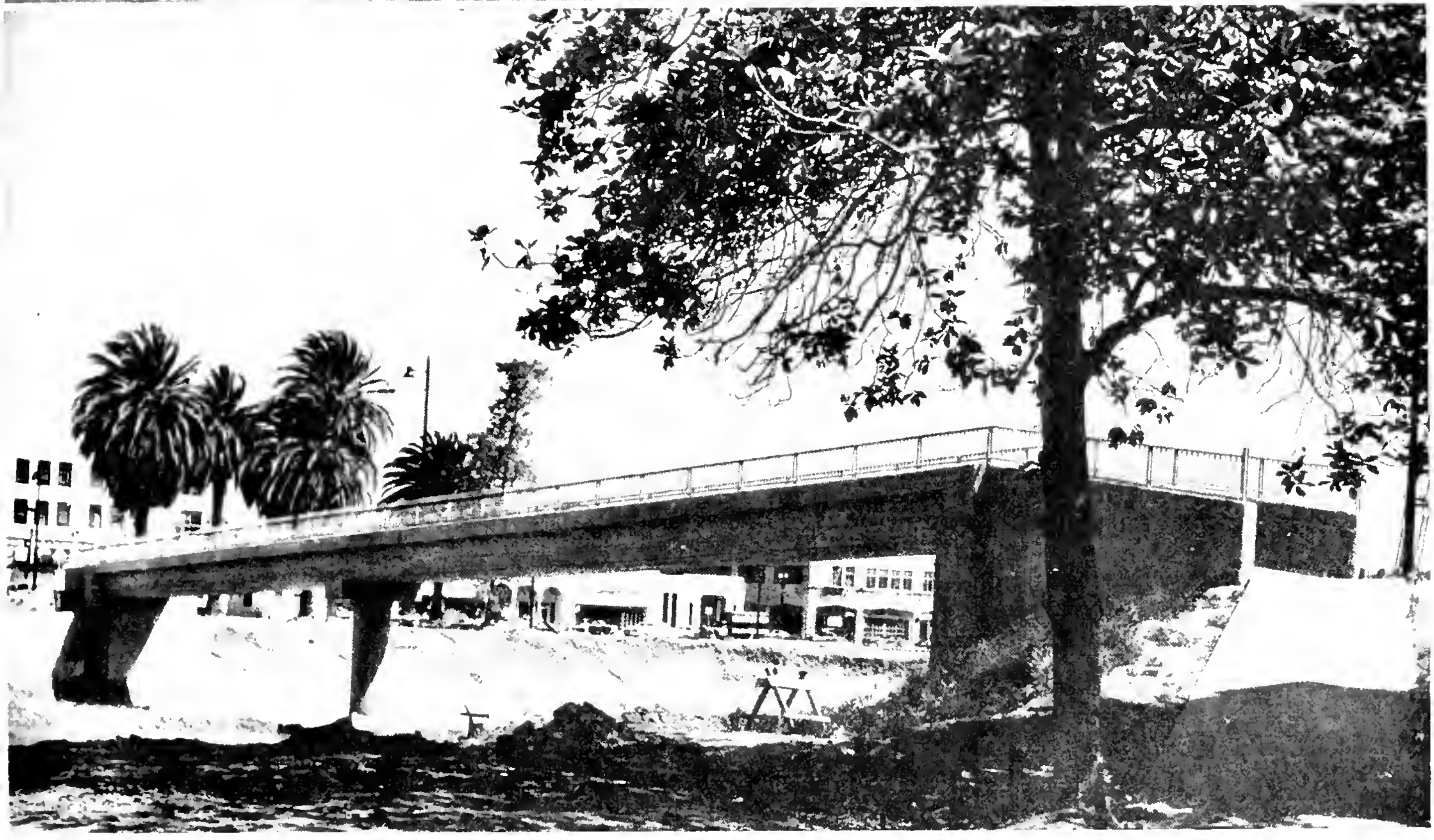
Contract work for the construction of this total 1.3 miles of freeway amounts to $1,655,000. The cost of bridges and miscellaneous structures amounts to 45 percent of the total cost of project the remaining 55 percent covers grading, paving, and miscellaneous work. The structure work included in this contract consists of 10 retaining walls of various sizes and lengths, the Washington Boulevard Undercrossing, the 21st Street Pedestrian Overcrossing, and the Figueroa Street Overcrossing at 23d Street. Other bridges and retaining walls within the limits of this contract, including structures over 11th Street, 12th Street, Pico Boulevard, and Venice Boulevard, were constructed under earlier contracts.

Looking southerly along completed section of Harbor Freeway from above Pico Boulevard, showing bus turnout on east side of freeway for northbound traffic. The city street shown on extreme left is Bond Street.

Looking southeasterly, showing portion of retaining wall and stairway construction on east side of Oak Street to provide passenger interchange between bus stop above and city street below

Extensive Retaining Wall

The largest retaining wall in this contract adjoins the bridge structure at Pico Boulevard and is located on the westerly side of the Harbor Freeway adjacent to Oak Street. This structure involved the placement of 2,000 cubic yards of concrete and 90 tons of bar reinforcing steel. The central section of this retaining wall car-



UPPER—Looking easterly along Washington Boulevard showing nearly completed underpass bridge structure carrying the Harbor Freeway.
LOWER—Looking southeasterly, showing Harbor Freeway in vicinity of 21st Street, construction details of pedestrian overcrossing.

ries at freeway level a special roadway to serve as a turn-out for southbound buses and a passenger loading and unloading area. A stairway seven feet in width was constructed for pedestrian use from the bus landing area on the freeway down to Oak Street at ground surface. A much smaller retaining wall on the other side of the freeway provides an area at freeway level for similar facilities for northbound buses.

The Washington Boulevard Undercrossing about one-half mile south of the bus turn-outs is a rigid frame box girder structure 106½ feet in length, which carries eight lanes of freeway traffic over Washington Boulevard.

Looking northwesterly along Harbor Freeway construction, showing nearly completed Figueroa Street bridge at 23d Street

The freeway roadways for north and southbound traffic are separated by a 12-foot median strip with open metal gratings at top curb elevation to provide light during the day for vehicular traffic underneath on Washington Boulevard.

Bridge for Pedestrians

To the south of Washington Boulevard a reinforced concrete pedestrian overcrossing has been constructed on 21st Street over the freeway. Bridge abutments with sidewalk ramps and a single circular pier near the center of the bridge provide the supports for span lengths of 100½ feet and 81 feet. The 4½-foot double girder section is in the form of a U, with the lower slab or walkway ramp being eight feet wide and the girders of the section forming the side walls. Ornamental galvanized steel picket fences have been installed for pedestrian safety on the tops of the side girders.

Southerly of the pedestrian crossing the freeway crosses under Figueroa Street, and one of the major features of this project is the unusual design of this structure. The bridge designer was confronted with the difficult problem of designing a freeway structure to carry 23d and Figueroa Streets where they intersect over the Harbor Freeway. The freeway crossing under the structure will carry eight lanes of traffic in addition to an inlet ramp from Flower Street on the northbound side. The bridge structure consists of eight separate frames or structures placed adjacent to each other. The longer span of this structure is parallel to Figueroa Street and about 108 feet in length, resting on expansion angles on the cantilever protruding from Bent No. 2 and on rockers on the bridge seat at abutment No. 1. The three exterior girders carrying the sidewalk are over eight feet in depth. The sidewalk slab forms the top of box girders for this span.

Design Requirements

In general, girder depths are seven feet for all frames south of frame No. 4, and four feet six inches deep north of this frame. Another factor resulting in complicated design requirements is the sharp 32-degree angle between the Harbor Freeway and Figueroa Street centerlines. Sidewalks, curbs and gutters have been constructed on the bridge to form the street intersection, with standard traffic signals at the four corners. Paving work for the street surface is plantmix surfacing placed immediately over the top slab of the bridge deck to conform with City of Los Angeles typical pavement sections. A standard 28-inch steel handrail was constructed on the outside of the 7-foot and 14-foot sidewalks.

This contract was approved for construction on July 10, 1953, with 360 working days allowed to complete all of the contract work. Construction work on the retaining walls and the bridge structures began about July 13, 1953. Due to the speed in which this contractor has completed the structure work, especially the progress made on Figueroa Street Bridge, it was possible to open this bridge to Figueroa Street traffic on June 4, 1954.

. . . Continued on page 64

Foothill Freeway

Will Relieve Traffic Congestion At Devil's Gate Dam

By H. R. LENDECKE, Resident Engineer

California motorists are about to receive another dividend on their gas-tax investment. Work was started late in February on the Foothill Freeway between Hampton Road in La Canada and Montana Street in northwestern Pasadena, Los Angeles County. The work, which is scheduled for completion early in 1956, is being done by George W. Peterson, Jack W. Baker and Dragline Rentals Company, joint venturers, who submitted a low bid of $1,831,071.

Foothill Boulevard is one of the two main routes which bypass the metropolitan Los Angeles area on the north, the other being Colorado Boulevard about 3.5 miles to the south, which is currently being improved. The purpose of the Foothill Freeway is to pass the congested Arroyo Seco Canyon at Devil's Gate Dam. This bottleneck has continually grown worse during peak traffic hours due to increased population in the foothill areas, and especially on weekends, since Foothill Boulevard serves the Angeles Crest mountain resort areas as well as traffic bypassing Los Angeles.

Realignment

This contract calls for constructing a four-lane divided highway about 1.75 miles long, with frontage roads, ramps, speed change lanes and road connections, and the construction of six reinforced concrete bridges and an equestrian tunnel. The present highway passes over Devil's Gate Dam, a Los Angeles County Flood Control District facility, and travels to the northwest over a narrow, curved alignment to Foothill Boulevard at the east end of La Canada and enters Pasadena to the southeast via winding city streets. This improvement will provide a realignment of the highway with full freeway status.

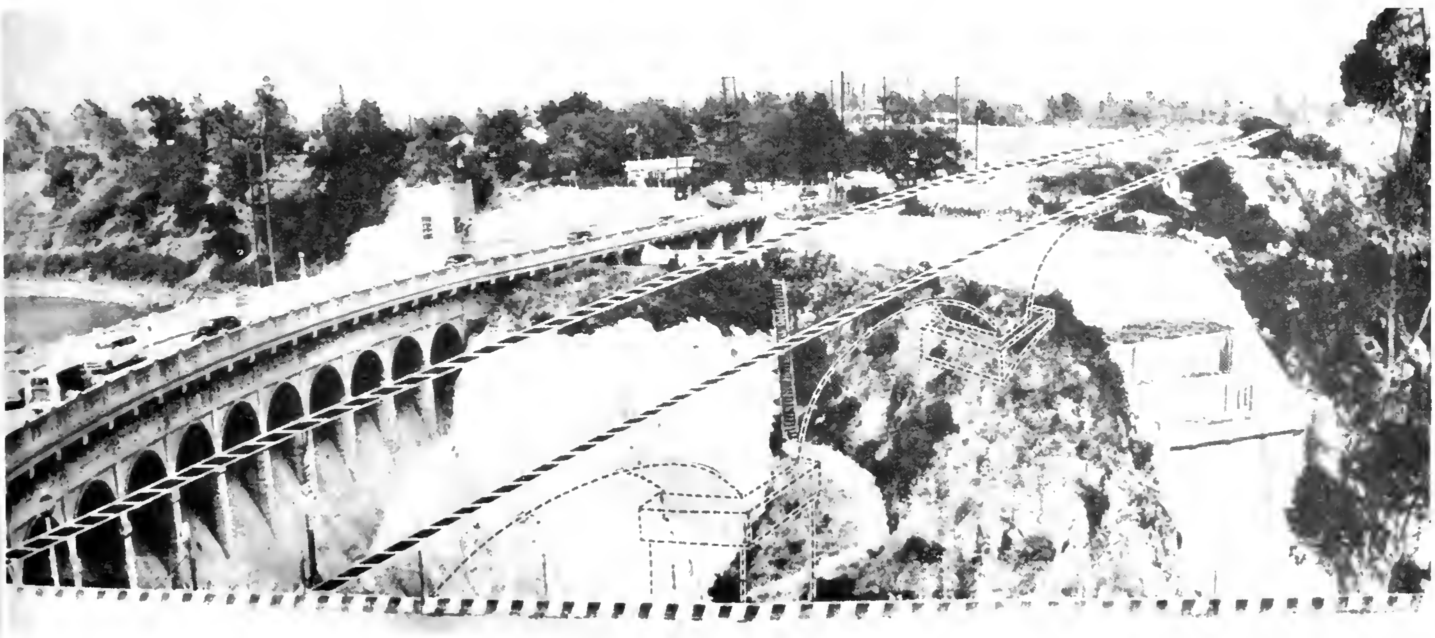
Artistic Bridge

The largest structure on this job is the 418-foot long Arroyo Seco Bridge which will lie just south of Devil's Gate Dam. This bridge will carry the freeway over the 110-foot deep gorge and over the dam spillway. Several aesthetic features have been incorporated in this structure. The massive center pier (which, incidentally, is hollow) rising from the floor of the gorge will have elaborate rustricated concrete surfaces on its shaft to where it joins with the pleasingly curved soffit of the bridge deck. The pier on the east bank of the canyon also has rustricated surfaces, which will provide a look of masonry construction to blend with the exposed fissured rock of the canyon walls. The curved arch-like deck soffit is accomplished by varying the girder depth of the box girder sections. The estimated cost of this structure based on contract prices is about $400,000.

The Flint Canyon Wash Bridge carries the freeway over Flint Canyon Wash. This seven-span structure will be constructed at a cost of about $200,000.

The Route 165/9 separation will carry Route 165 and local traffic from

On this photograph the artist has drawn in lines to indicate how the bridge now under construction on Foothill Freeway at Devil's Gate Dam will fit into the topography. Photo courtesy Los Angeles Times.

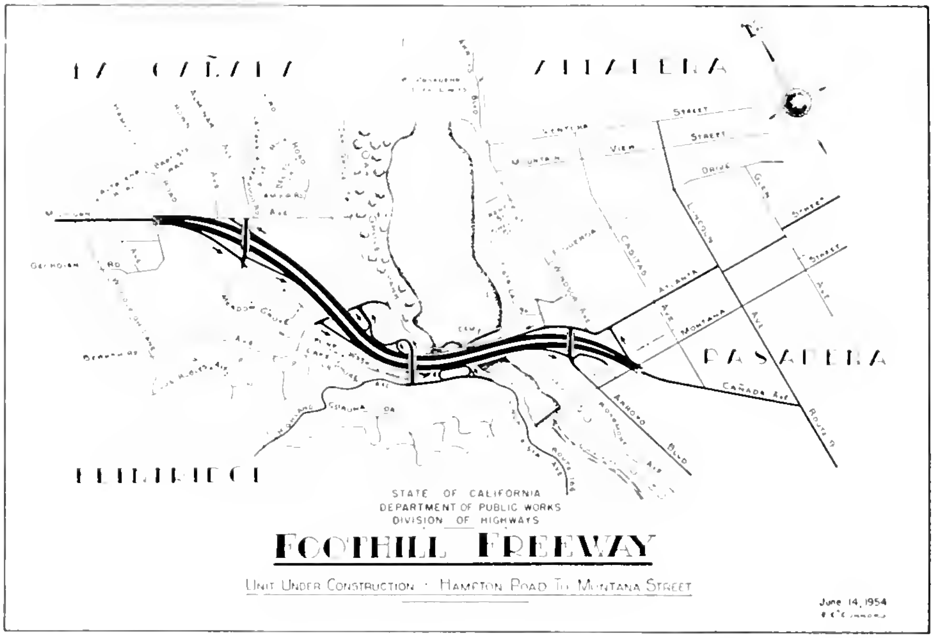


the exclusive Flintridge Hills area over Flint Canyon Wash and over the freeway to ramp connections with the freeway. This structure is being built in two phases, the first passing about 70 feet above the wash supported by tall, six-foot diameter, multifaced pier columns. In the second stage the bridge will be built over the freeway in embankment area, with the pier footings resting on steel piles. The total length of this bridge is about 345 feet and the cost about $140,000.

The Meadow Grove Avenue Overcrossing will carry Meadow Grove traffic over the freeway. This box girder structure is about 157 feet long and will cost an estimated $85,000.

The Arroyo Boulevard Overcrossing will connect Arroyo Boulevard with the north frontage road. This box girder structure is about 107 feet long and will cost $70,000.

The area adjacent to this contract is a favorite spot for equestrians and contains many bridal paths. To provide passage across the freeway an equestrian tunnel 8 x 10 feet, 118 feet long has been provided under the highway just east of Devil's Gate Dam.

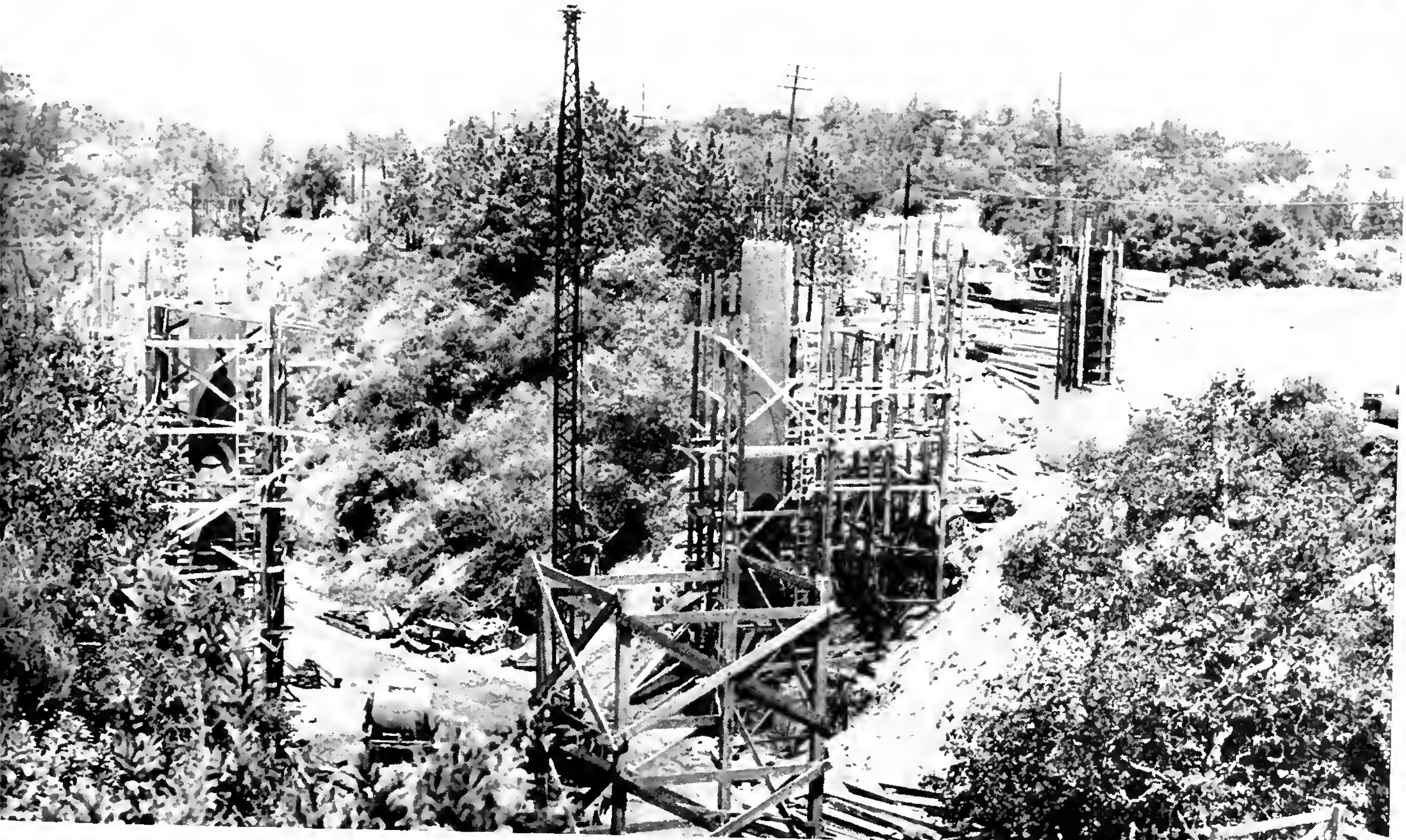


Close Cooperation

A portion of this project is within the jurisdiction of the Los Angeles County Flood Control District. The Flint Canyon Wash bridge and the Route 165/9 separation and some roadway embankment are located in the reservoir storage area. The Arroyo Seco Bridge also passes over the dam spillway. Because of these factors, extensive scheduling and close cooperation with the Flood Control District are necessary in order to maintain the reservoir capacity. Substructure work in the reservoir area as well as placing of falsework in the storage area and the dam spillway area must be scheduled for the summer dry season. Special care must be exercised to remove construction debris from the storage area to prevent damage to the flood control structures prior to the rainy season.

The construction of this portion of the Foothill Freeway is a major step in the solution of some of the traffic problems of the north central Los Angeles area. This construction contract is being administered by the Bridge Department with Mr. Louis Steele acting as District VII representative.

Looking south toward Highland Avenue cut. Structure in foreground is Berkshire Avenue Undercrossing which is substantially completed



ER: Looking west along centerline of Foothill Freeway, showing site of Arroyo Seco Bridge. LOWER: Looking north toward Route 165/9 separation structure, showing piers Nos. 4, 5, and 6 under construction.

Industry and Frontage Roads

Continued from page 22 . . .

more desirable than comparable sites on Slauson Avenue (conventional street in industrial area) located approximately the same distance from downtown Los Angeles. Whereas Slauson Avenue was considered a better industrial location in 1950, the frontage road sites are now considered better. The primary reason for this feeling is the advertising value adjacent to the freeway.

Swedlow Plastics Co., 6986 Bandini Boulevard

This industrial firm is one of the largest employers in the area. Prior to constructing their new building on Bandini Boulevard, this company had leased plant facilities in other industrial districts. Before making a large investment for the construction of their own plant, this firm made a thorough study of possible site locations in order to be sure that the building would be in the right place. The new plant site is opposite the Garfield Avenue ramps to and from the freeway. Primary conclusions of the firm with respect to the freeway are:

1. The new building site was chosen in early 1952 on Bandini Boulevard adjacent to the Santa Ana Freeway in preference to other available industrial sites because of consideration of the ultimate value of the property at this particular location, particularly in the event it would be necessary to sell the property at a future date.
2. Certain advertising advantages to the business by reason of being located near the freeway.
3. The freeway contributes immeasurably as a convenience factor to employees and business associates.
4. The freeway is distinctly a property appreciation factor!

Ziegler Steel Corp., 7022 Bandini Boulevard

The Ziegler Steel Corporation plant on Bandini Boulevard conducts operations as a steel jobber. The distance from the plant to nearest freeway exit and entrance is approximately 200 feet. General comments made by this industry with respect to their frontage road site near the Santa Ana Freeway are:

1. Ease of delivery. The commercial deliveries to the San Fernando Valley and Hollywood areas are now made in approximately half the time that was required for delivery from their previous plant location in the industrial area south of downtown Los Angeles.
2. Orange County can now be served with the company-owned trucks. Before the construction of the freeway, traffic was so congested it was necessary for Orange County to be served by common carrier.
3. The freeway has made it easier for the firm to get employees. Before the freeway was built, prospective employees living some distance from the plant were reluctant to work in this area.
4. The company feels that the freeway in every way has been an asset and in no manner has it been a detriment to the operation of its industrial plant.
5. Illuminated signs have been installed on the buildings to take advantage of the advertising value adjacent to the freeway.

Wm. Simpson Construction Co., 7228 Bandini Boulevard

The offices for this construction company are located in downtown Los Angeles. For the successful operation of the business it is necessary to have warehouse facilities which are easily accessible to the entire metropolitan Los Angeles area. The warehouse on Bandini Boulevard is approximately 1,400 feet from the nearest freeway entrance and exit. The feeling of the company with respect to the freeway has been summarized as follows:

It would have been almost out of the question to locate a warehouse that far out of town if it had not been for the freeway. The Santa Ana Freeway makes it possible for us to get to the center of town in less time than from the old location at 32d and Alameda. (That location was one-third the distance of the new frontage road site to the downtown area.)

American Heat Treating Corp., 7436 Bandini Boulevard

This plant is engaged in the commercial heat treating business. The attitude of this industrial firm with respect to the Santa Ana Freeway was expressed by one of the officers as "amazing." The distance from this new plant to the Garfield Avenue entrance and exit to the freeway is approximately 2,400 feet. General comments of this firm with respect to the freeway can be summarized as follows:

Since the completion of this new industrial plant on the frontage road (Bandini Boulevard), freeway motorists have made inquiries that could add an estimated \$4,000 to \$5,000 worth of business per month. The new plant was built in this location to accommodate a normal business increase, but the freeway has generated an increase so great that the present plant cannot accommodate it. It is the opinion of this industry that if the plant were located on a site not visible from the freeway the additional volume of business would not be available.

Pioneer Broach Co., 6434 Telegraph Road

This industrial firm manufactures precision tools. Their new plant is located at the corner of a freeway off-ramp and Telegraph Road (Test Area "B"). Highlights of the comments made by this firm in regard to their new location adjacent to the Santa Ana Freeway are as follows:

1. The business had been established in downtown Los Angeles before moving to this location adjacent to the freeway.
2. The need for business expansion necessitated a new site which

would offer accessibility to customers and business associates by means of rapid transportation.

3. The new site near the Santa Ana Freeway provided the said requirements set forth above. Customers living in the San Fernando Valley area ‡ find it easier to get to the new plant site than to the old downtown location, although the former site was closer to the San Fernando Valley area by six miles. The new site near the freeway has made it possible to hold customers who might otherwise have been lost, because of the difficulty in driving and parking in the downtown location.
4. Employees have moved into suburban residential areas to take advantage of the close proximity of the plant and the rapid transportation to and from the plant via the freeway.

Central Scientific Co., 6446 Telegraph Road

This industrial plant located between the Santa Ana Freeway and Telegraph Road (Test Area "B") at the corner of a freeway off-ramp had this to say with regard to their new plant location:

1. Central Scientific Company in the latter part of 1951 was the first large concern to locate in the area of Santa Ana Freeway—Telegraph Road, excluding the Lever Brothers plant.
2. This company had numerous locations to select from in the general vicinity of the freeway, but picked this specific location because of the availability of rapid transportation and accessibility of plant for employees and customers.

Annin Corporation, 6570 Telegraph Road

This new plant is located between the freeway and Telegraph Road (Test Area "B") and approximately 775 feet from the nearest freeway off-ramp. The attitude of this corporation in regard to the freeway can be summarized as follows:

1. One of the main problems in finding a suitable location for the establishment of this plant was the transportation for not only the executive employees but also the skilled personnel. This location adjoining the Santa Ana Freeway answered this problem because of availability of rapid transportation.
2. On a percentage basis, the proximity of the Santa Ana Freeway influenced the selection of this site 50 percent.

‡ 25 miles from Test Area "B" to the central section of San Fernando Valley area.

CONCLUSION

Industries looking for new plant sites in those sections of the State where there are new freeways, can profit by the experience of the industries located on the frontage roads along the Santa Ana Freeway.

A summary of comments by property owners is as follows:

1. The freeway is distinctly a property appreciation factor to adjoining property.
2. The freeway is an asset from an advertising standpoint to business located on a frontage road.
3. Moving to an industrial location near the freeway has made it possible to retain customers discouraged by traffic congestion.
4. The freeway contributes immeasurably as a convenience factor to employees and business associates.
5. Industrial location on frontage road along the freeway accounts for additional business per month which is attributable entirely to prospective customers using the freeway.
6. The freeway facilitates distribution of goods. Crosstown delivery from south to north has been reduced to one-third the former time.
7. The freeway is advantageous in directing customers to the plant without their getting lost on unknown industrial streets.

The enhanced land values and the enthusiastic endorsement by the property owners conducting business along these frontage roads is conclusive evidence that when industrial improvement represents the highest and best use for land, the location of an industrial site in close proximity to a freeway is a definite advantage.

This study also shows that a location of an industrial enterprise on a frontage road, whether near or some distance from the exit or entrance to the freeway, does not affect the land value or the success of the business. The results of this study should eliminate the erroneous assumption many people have that an industrial site on a frontage road cannot succeed unless it is directly opposite an opening into the through traffic lanes.

In Memoriam

FRANK A. JOHNSON

In poor health since his retirement last April as principal structural engineer in charge of structural design for the State Division of Architecture, Frank A. Johnson died in Sacramento on June 21st at the age of 65 years.

A graduate of University of California, Mr. Johnson received his basic experience from 1906 to 1909 in his native San Francisco with Dyer Bros., Pacific Rolling Mills, and H. J. Brunnier. He was in private practice from 1911 to 1933.

During this period, he was structural designer on the Pacific Southwest Building and San Joaquin Light and Power Building in Fresno; the main building group of St. Mary's College in Moraga; the Balfour, Guthrie, Standard Oil, and American National Bank buildings in San Francisco, the Broadway Tunnel, and portions of the Golden Gate Bridge approaches.

Mr. Johnson entered the division in June, 1933, and served nine years as supervising structural engineer in administration of the Field Act in Southern California.

He leaves a widow and two daughters.

MATURE DRIVER

Are you the kind of driver who experiences keen pleasure in showing some courtesy on the road? Then you are a mature, sportsmanlike driver.

Weldon Canyon

Golden State Freeway Bridges Under Construction

By C. J. WOODBRIDGE, Associate Bridge Engineer

The first section of the Golden State Freeway within the City of Los Angeles is now being constructed north of San Fernando from near the intersection of San Fernando Road and Sepulveda Boulevard northerly to beyond the city limits in Weldon Canyon, a distance of three miles. This construction is now in progress and the general features and road work were discussed by Resident Engineer Robert H. Butler in the January-February, 1954, issue of *California Highways and Public Works.* The purpose of the present write-up is to give detailed information concerning structures. Included in this contract are seven bridges, the value of which total about one-third of the contract bid of over $3·000·000.

Seven Bridges

Beginning at the southerly end of the project the bridges listed in order are as follows:

The Route 158 + separation is a single span to carry the northbound freeway over the southbound ramp to San Fernando Road.

The Route 4 157 separation and overhead consists of twin bridges which will carry the freeway traffic over San Fernando Road and over the track of the Southern Pacific.

The Los Angeles aqueduct bridge will carry the freeway over the open channel of the Owens Valley-Los Angeles Aqueduct.

The Route 4 23 southbound interchange and the Route 4 23 separation are given two separate bridge numbers and will provide a "three-level" separation of traffic at that junction of U. S. Routes 6 and 99.

The Weldon Canyon Overhead crosses a small box canyon located over the Southern Pacific Railroad tunnel. The structure is being built to avoid placing a large roadway embankment across the canyon, as it is recognized that such a heavy dead load should not be added to the present load now supported by the concrete lining of the railroad tunnel because failure might result. Drilled piles up to 80 feet long were used to transmit the bridge load to an elevation below the railroad track in the tunnel. This procedure makes certain that no damage will result to the railroad tunnel because of the freeway construction above it.

Weldon Canyon Undercrossing

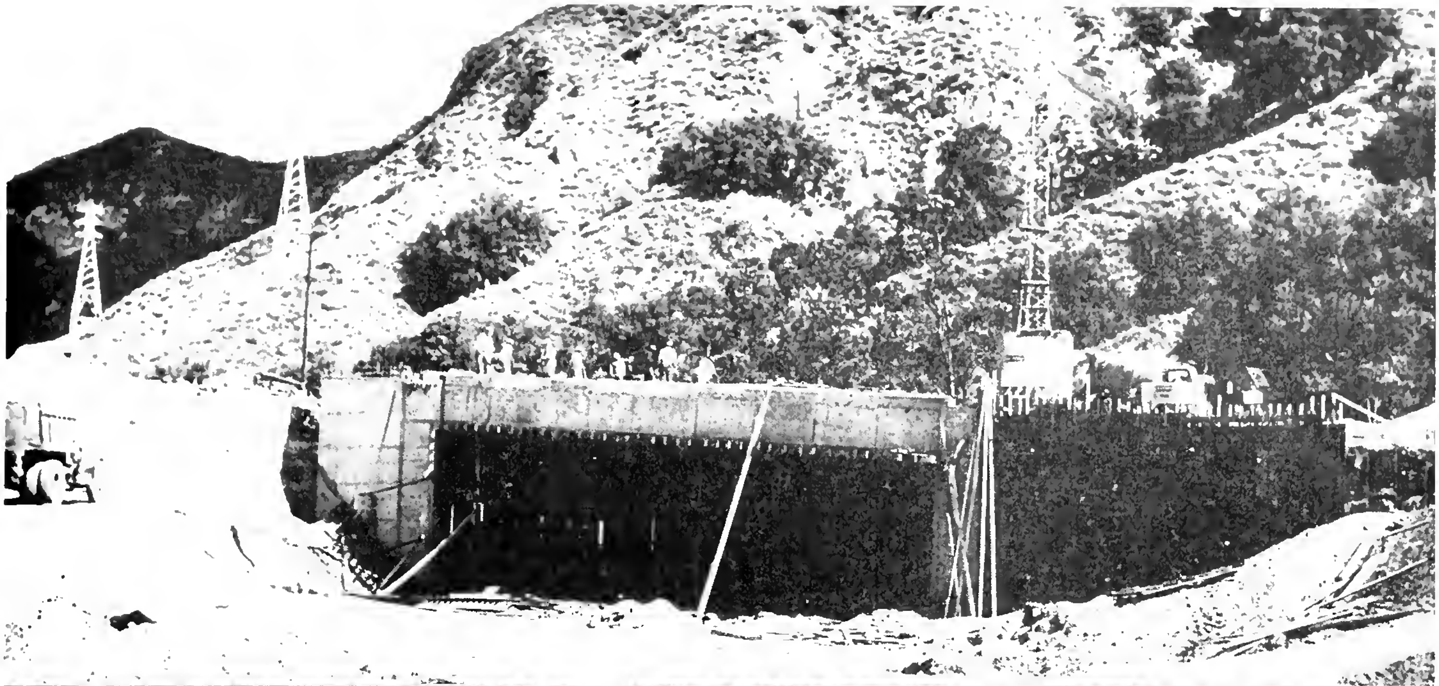
The Weldon Canyon Undercrossing will carry freeway traffic over a ramp connection to the present highway US 99. This bridge is a single span having a skew of about 56 degrees, with abutments founded on new fills up to 60 feet deep. The abutments are adjusting themselves to differential fill settlements through the vertical expansion joints. About half a million cubic yards of embankment have been placed in Weldon Canyon in the vicinity of the bridge, so that some movement is to be expected.

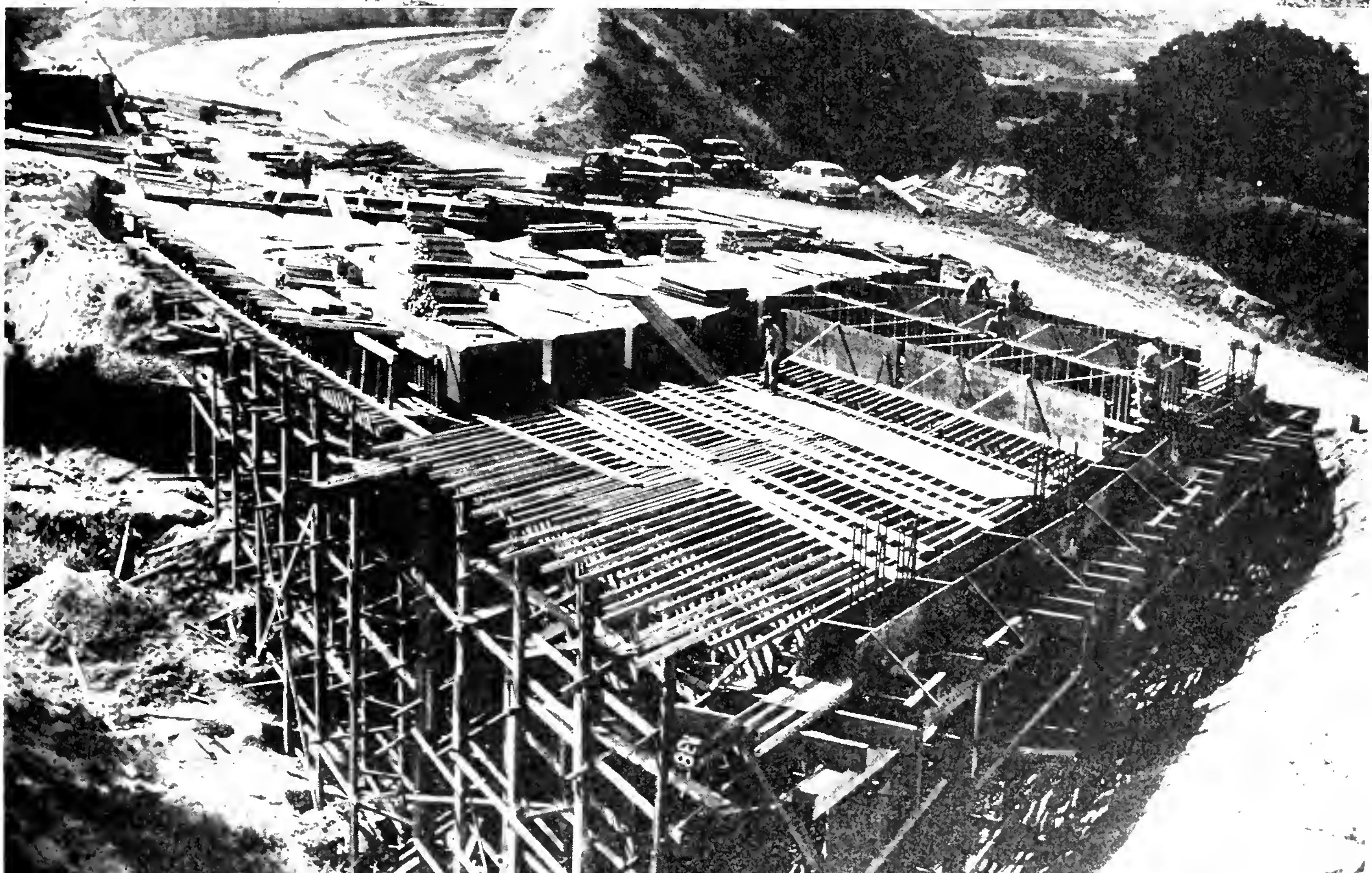
Bridges over freeways are important. They separate traffic streams, thus preventing exasperating traffic jams which often develop at heavily traveled intersections.

A good example is at the present intersection of U. S. Routes 6 and 99 (State Routes 23 and 4) where regular weekend traffic jams are a headache to the public and police alike. As many as six policemen are now required to keep traffic moving, particularly on Sundays, while motorists crawl along in low gear "stop and go" for several miles to pass the intersection. When the three-level structure is completed and all the roadways are in use by public traffic, which will be sometime next spring, the motorists can roll along in high gear.

The contract work is being done by Griffith Company with J. Tomei and Sons doing the grading work. For the Griffith Company, Joe Porcher is construction manager and Hal McGregor is superintendent. The State is represented by R. H. Butler as Resident Engineer and the writer as Bridge Department representative.

Looking westerly at Golden State Freeway bridges over San Fernando Road and the mainline Southern Pacific Railroad track





UPPER: Looking northerly at Golden State Freeway bridge over northbound ramp connection from San Fernando Road. LOWER: Looking southerly along freeway, showing construction in progress on Weldon Canyon Overhead. This structure is over the Southern Pacific Railroad mainline tunnel and is being built to avoid placing a heavy fill load over the tunnel.

US 99 Progress

Highway Reconstruction Through Riverside County

By J. DEKEMA, Assistant District Engineer

With the award of a 2¼ million dollars contract to McCammon-Wunderlich and C. K. Moseman of Palo Alto, reconstruction of US 99 through Riverside County is swinging into high gear. Designated as Route 26 in the State Highway System, this road also carries US 60 and 70 from Beaumont to Indio. This latest improvement is for the construction on new alignment of 14.4 miles of four-lane divided expressway between a point 2.3 miles west of Garnet and Thousand Palms. M. E. Nelson is the resident engineer.

Sandstorm Area

Considerable study and investigation was made before selecting the adopted route. It has been necessary, at various times in the past, to close the existing highway during extremely heavy sandstorms prevalent in this area. Many motorists can attest to windshields pitted to a frosted condition and cars sandblasted to a bright metal finish. While it was impossible to locate the highway around the sandstorm area, several precautionary methods were provided in minimizing the influence of the sand on traffic.

While the sand blows across the existing road at an angle, the location chosen is such that the prevailing winds are parallel to the new centerline. The volume of sand crossing the road is, therefore, expected to be a minimum. The grade line was raised so that profile grade is four to six feet above the surrounding countryside. This insurance against the accumulation of sand on the highway has long been known to engineers familiar with the problem of drifting snow or sand. The high grade line has the further advantage that the larger particles of sand cannot be lifted above the desert floor to roadbed elevation. It is these larger particles that effectively sandblast passing cars, and while visibility on top of the fill may be impaired, the dust should be relatively harmless to exterior finishes. As a final guard against sand damage, the median and all embankments from the toe of slope to the edge of pavement will be covered with a gravel blanket, for which the specifications permit 100 percent passing the 3-inch sieve and 25-35 percent passing the No. 4 sieve. Engineers anticipate closure of the road will be rare and that maintenance expenditures will be at a minimum, all at the relatively small cost of 88 cents per ton for 150,000 tons of gravel material.

The oasis of Thousand Palms is in sharp contrast to the arid wasteland surrounding it

Future Project

A future District XI project will cover the 11 miles between the south end of the current contract at Thousand Palms and Indio. It is at the oasis of Thousand Palms that the traveler heading east from the coastal plain, having entered the Colorado Desert through the San Gorgonio Pass, first discovers the great fertility of this region. Vineyards, date palm groves, and grapefruit trees with their cool green verdure are in sharp contrast with the surrounding desert. With the importation of Colorado River water through the great All-American canal, the Coachella and Imperial Valleys of the Colorado Desert have become vast agricultural productive centers.

As a result, thousands of trucks pound up and down US 99, 24 hours a day throughout the year. Twenty-five percent of the traffic on this road is composed of trucks, and the pavement and base of the current contract are designed to support 22 million 5,000-pounds equivalent wheel load repetitions during its initial 10 years of service. Although the native material is of excellent quality and in most cases will support substantial traffic with only a light road oil treatment, eight inches of cement-treated base and four inches of plant-mixed surfacing are needed on top of the basement soil to withstand the incessant pounding to which this highway is subjected.

Coachella Valley

The Coachella Valley derives its name from the misspelling of the Spanish word "Conchella," meaning little shells. The area was once an arm of the Gulf of California and later a great inland lake, and remains of aquatic life are numerous. The Washingtonia palms found at the oases in the foothills along the San Andreas Fault are believed to be the remains of what was once a tremendous palm forest. Date palms were imported from North Africa and the Middle East about the turn of the century, and today nearly all commercial dates produced in the United States are grown in the Coachella Valley.

Although this project traverses 14 miles of arid waste land, six pairs of bridges are to be constructed across various desert washes. To the tourist unfamiliar with the torrential rains that occur in this desert in the late summer and early fall, these bridges must present a strange picture. The average rainfall is only about three

UPPER: Recently completed bridges across Whitewater River. Although the channel in this February scene is dry and dusty, a peak discharge of 42,000 cubic feet per second was recorded at this site in the March, 1938, flood. LOWER: Looking south from the vicinity of Whitewater toward Coachella Valley. Recently completed construction in foreground. Palm Springs in center background beyond Whitewater River.

inches per year, but in nearby Imperial almost four inches of rain have been recorded in less than one hour at the height of a cloudburst.

Roadway Embankment

An interesting feature of this contract is the payment of 780,000 cubic yards of roadway embankment in place rather than the usual method of payment in excavation. This change in normal procedure was adopted for various reasons. Most of the embankment is to be obtained from side borrow areas, and there is a distinct possibility that these borrow pits will fill in during a severe sandstorm before they can be cross-sectioned and measured. Unless the embankments are quickly covered with gravel blanket and cement-treated base, it is also possible that several inches from the top of the fill may blow away in a sandstorm. It will be to the contractor's advantage to keep construction of the fill and blanket close together to minimize the probability of losing many thousands of cubic yards of fill material.

Rainfall is so rare that there are few well-defined drainage channels. The side borrow ditches, while they are expected to fill with sand to some extent, will serve for the purpose of collecting, ponding, and distributing the flash runoffs that occur during summer thunderstorms.

Heavy Excavation

In addition to the roadway embankment, there is also an item of over 300,000 cubic yards of roadway excavation, making a total of well over a million cubic yards of earthwork. Including the gravel blanket, over a half million tons of processed aggregates will be required for base, pavement, and structures, together with a quarter million sacks of cement. If all the asphalt required were to be delivered in a continuous operation, the convoy of tank trucks and trailers would be 20 miles in length, assuming a minimum legal spacing of 200 feet.

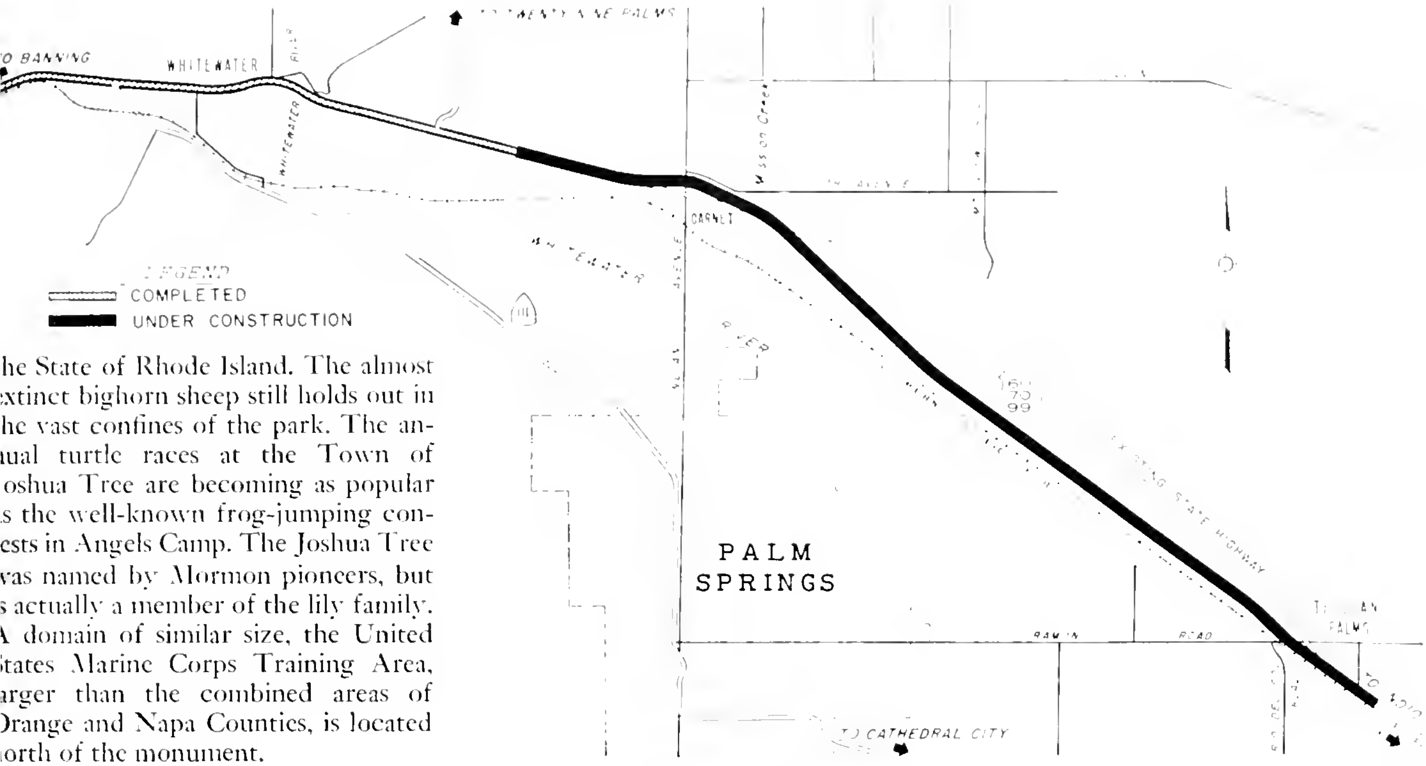
This project is a continuation of two contracts recently completed by Basich Brothers Construction Company at a cost of nearly $1,500,000 for 6.2 miles between the junction of US 99 with SSR 111 and a point 2.3 miles west of Garnet. Three resident engineers in succession represented the State on these projects, W. H. Crawford, E. A. Bannister, and T. M. Borman. As a part of the second of these two contracts, the intersection with the highway to Twentynine Palms was channelized.

Rapid Development

Only 19 of the 29 palms discovered by Col. Henry Washington in 1855 remain today. While Col. Washington would no doubt recognize the palm trees named in his honor, he would certainly blink his eyes at the tremendous development of this high desert area. Several thriving communities have sprung up in this once isolated desert valley, now only a few hours from the great metropolitan centers of Southern California by modern highway transportation.

The Twentynine Palms Road also leads to the entrance to Joshua Tree National Monument, a desert wonderland of 1,300 square miles, larger than

This formation in Joshua Tree National Monument is known as Giant Rock, and is estimated to weigh about 100,000 tons



he State of Rhode Island. The almost :xtinct bighorn sheep still holds out in he vast confines of the park. The an-1ual turtle races at the Town of oshua Tree are becoming as popular s the well-known frog-jumping con-ests in Angels Camp. The Joshua Tree vas named by Mormon pioneers, but s actually a member of the lily family. A domain of similar size, the United States Marine Corps Training Area, arger than the combined areas of Drange and Napa Counties, is located orth of the monument.

San Gorgonio Pass

From the Coachella Valley, the ighway climbs gradually into the San Gorgonio Pass between the San Ja-into Mountains on the south and vest and the San Bernardino Moun-ains on the north and east. An amount f $280,000 has been earmarked in he 1954-55 Fiscal Year construction udget for building the grade separa-ions for the freeway through Ban-ing a few miles east of the summit of he pass. Elimination of this bottle-eck, as well as the narrow winding roller coaster" between Garnet and Thousand Palms, will be welcomed by he thousands who travel this major ranscontinental highway. Certainly a igh of relief will be heard from the 5,000 motorists who crawled through Banning's two-lane city street on a re-ent peak Sunday.

Upon completion of these projects, ll the 37 miles of US 99 in District VIII's portion of Riverside County vill be four lanes, although there is as et no access control through Beau-nont and Cabazon. A freeway loca-ion bypassing Cabazon has been dopted by the California Highway Commission, and studies are currently nder way through Beaumont.

Authorities on the subject of high-vay transportation economics have estimated savings as high as 4 cents per mile for the motorist traveling on a freeway compared to congested city streets. Even if the average saving on these 37 miles is only one-fourth of that amount, the impressive total of $2,000,000 per year is accumulated. As future traffic increases, this annual to-tal savings will become even greater, proving once again that the motorist pays for freeways whether he has them or not.

UPPER: Intersection of US 99 and road to Twentynine Palms and Joshua Tree National Monument has been channelized as shown here in the latest contract completed. Snow-capped Mt. San Jacinto, elevation 10,831, in background. LOWER: Note heavy trucks pulling upgrade from Coachella Valley into San Gorgonio Pass. Before completion of this four-lane section, each truck would have been trailed by five to twenty passenger cars.

Retirements *from* Service

Helen F. Randolph

Mrs. Helen Frances Randolph, Supervising Stenographer-clerk with the Division of Highways, Office Engineer Department, officially resigned on July 21st, after over 31 years of continuous service with the State of California. A party honoring Mrs. Randolph was held on July 2d at the Capitol Inn.

HELEN FRANCES RANDOLPH

Born in Sacramento on August 8, 1903, as Helen Sullivan she received her education in the local schools and, after working as a legal stenographer in a law office, went to work in the State Department of Agriculture as a junior stenographer in January, 1923.

Her next position was as an intermediate stenographer with the Department of Finance, where she worked from November, 1923 to January, 1927.

In 1927, when Governor C. C. Young took office, the Finance Department loaned Helen to the Governor's Office. Within a few months, Governor Young decided he needed Helen's services permanently and requested she be transferred to his office. After working as secretary for the Governor's two secretaries for the next three years, Mrs. Randolph transferred to the Adjutant General's Office. It was here that she received her rating of senior stenographer.

But Helen had not yet found the office where she really wanted to settle down, and so in February, 1931, she went to work with the Division of Highways in the office engineer's department.

In June, 1933, she took over the duties of supervisor in the office engineer's department. Mrs. Randolph has seen her stenographic unit grow from 10 employees to its present 21, and has hired and trained over 300 women employees during the intervening years.

Helen married Tipton W. Randolph in November, 1933. She intends to travel with her husband who is also retired. They hope to visit some of the places of interest they have heard so much about, and also do a little fishing, golfing, and hunting along the way.

James B. Woodson

The organization for the construction of the California State Highway System began on January 1, 1912. Upon that momentous occasion, seven men took office under Austin B. Fletcher, the first Highway Engineer, who had been appointed by Governor Hiram Johnson. These seven men took their respective assignments in the then seven divisions (later districts) throughout the State.

JAMES B. WOODSON

Jim Woodson had charge of the Fresno Division VI which comprised nine counties, being seven in the San Joaquin Valley and Inyo, Mono and part of Kern east of the Sierra. The first Division VI headquarters consisted of a single apartment in the Old Forsythe Building in Fresno. Woodson's office was the kitchen. The bedroom was the drafting department, and the bathroom was the blueprint laboratory. In those early days, the Division Engineer had more duties than he has now, 42½ years later. He not only handled the reconnaissance, the location, the rights of way, the construction, the bridges and the maintenance, but also personally sold the bonds, as the original $18,000,000 bond issue carried only a 4 percent

. . . *Continued on page 64*

Harold H. Hill

Harold H. Hill, associate right-of-way agent with District III, Division of Highways, retired July 31, 1954, after 12 years of state service.

Harold has always claimed to be a native of the rugged eastern state of Vermont, but research developed the fact that his parents lived in Arizona, and were merely visiting in Waitsfield, Vermont, when Harold was born July 28, 1896. His parents returned to the West Coast soon after the happy event and Harold's early life was spent around the Los Angeles area.

HAROLD H. HILL

World War I interrupted Harold' career. He was not lucky enough t be sent overseas, and was in OC when the armistice was signed. H was rather foot-loose in the earl days and there is hardly a place on th Pacific Coast that he has not worke nor any job he hasn't tried. In th early 20's he ran a tire shop in Sacr mento and was probably responsib for many of the flat tires prevalent that time. His wanderings were som what curtailed in 1925 when he ma ried Miss Claire Mahan of Virgini

From 1936 to 1938 Hill worked title searcher for the County of L Angeles, and from 1938 to 1942 title searcher for Department Water and Power of Los Angeles.

In May, 1942, Harold started as a sistant right-of-way agent at Mary ville, California, where he continu until his retirement.

Harold is a member of Jord Lodge, F. & A. M., Los Angeles, B Ali Shrine and the York and Scotti Rite bodies.

Harold and Claire Hill intend to r main in Marysville.

Cost Index

ontinued from page 43 . . .

ndex at 212.3 for the first quarter of 954 continues, on a national basis, to ollow closely the California Index. 'he Engineering News-Record Index, which includes all classes of contruction on a nation-wide basis, ontinued during the second quarter s gradual rise, from 253.9 to 255.8 0.7 percent). The large percentage f building construction included in his Index is apparently responsible or the differences between it and the wo road construction cost indexes.

As stated previously, it is now beeved that highway construction costs n California will continue to decline uring the next three to six months ntil a balance is reached between the actors of increased labor costs and ne present keen competition among ontractors, at which time an upward 'end may be expected.

Highway Progress

Continued from page 4 . . .

must be accommodated. A careful inventory has been made of these needs and plans are under way to convert our present highway system into a fully adequate one.

How rapidly this can be accomplished depends to a large degree on the amount of money available for construction. Under the present law there will be a decrease on July 1, 1955, of one-half cent per gallon in the state tax on gasoline and diesel fuel and a corresponding reduction in the other highway user taxes. It should be recognized that this will result in an appreciable slowdown in our present rapid construction pace. This reduction in available construction funds is estimated to be in excess of $25,000,000 per year.

CHIEF JUSTICE WRITES

Chambers of The Chief Justice
SUPREME COURT OF THE UNITED STATES
Washington, D. C.

Mr. Kenneth C. Adams, *Editor*

Thanks very much for seeing that I receive a copy of *California Highways and Public Works.*

I always have enjoyed this magazine very much, and now it serves as a link with the past. It is good of you to take care of it for me.

With best wishes,

Sincerely,

(Signed) Earl Warren

Governor Knight has announced that it is his intention, in the coming months, to ascertain the desires of the people of California with regard to the continuance of present highway user taxes in order that he may make appropriate recommendations to the 1955 Session of the Legislature on this vital question.

CALIFORNIA DIVISION OF HIGHWAYS—AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Crusher run base, per ton	Plant-mix surfacing, per ton	Asphalt concrete pavement, per ton	PCC pavement, per cu. yd.	PCC structures, per cu. yd.	Bar-reinforcing steel, per lb.	Structural steel, per lb.
940	$0.22	$1.54	$2.19	$2.97	$7.68	$18.33	$0.040	$0.083
941	0.26	2.31	2.84	3.18	7.54	23.31	0.053	0.107
942	0.35	2.81	4.02	4.16	9.62	29.48	0.073	0.103
943	0.42	2.26	3.71	4.76	11.48	31.76	0.059	0.080
944	0.50	2.45	4.10	4.50	10.46	31.99	0.054	0.132
945	0.51	2.42	4.20	4.88	10.90	37.20	0.059	0.102
946	0.41	2.45	4.00	4.68	9.48	37.38	0.060	0.099
947	0.46	2.42	4.32	5.38	12.38	48.44	0.080	0.138
948	0.55	2.43	4.30	5.38	13.04	49.86	0.092	0.126
949	0.49	2.67	4.67	4.64	12.28	48.67	0.096	0.117
st quarter 1950	0.34	2.22	3.65	3.74	....	40.15	0.077	0.081
d quarter 1950	0.40	2.13	4.48	3.74	10.86	43.03	0.080	0.105
d quarter 1950	0.41	2.32	4.25	5.50	10.91	44.34	0.093	0.131
h quarter 1950	0.42	2.81	4.64	4.61	12.55	43.18	0.098	0.120
t quarter 1951	0.45	3.07	4.06	5.22	11.71	46.38	0.103	0.206
d quarter 1951	0.63	3.88	4.56	4.63	12.93	51.50	0.105	0.166
d quarter 1951	0.56	2.88	4.59	3.90	12.41	46.14	0.107	0.165
h quarter 1951	0.66	2.91	5.66	4.89	12.71	49.38	0.105	0.169
t quarter 1952	0.56	3.25	4.88	4.77	14.25	47.46	0.094	0.152
d quarter 1952	0.53	3.19	5.29	4.13	14.20	49.12	0.091	0.143
d quarter 1952	0.55	2.61	5.49	4.60	12.80	48.21	0.094	0.132
h quarter 1952	0.66	2.68	4.97		12.53	48.45	0.094	0.128
t quarter 1953	0.45	2.48*	5.27	4.46	12.47	53.19	0.098	0.150
d quarter 1953	0.50	2.07	5.38	4.59	13.06	52.68	0.091	0.132
d quarter 1953	0.54	2.15	5.30	4.82	13.78	49.23	0.092	0.129
h quarter 1953	0.48	2.11	4.74	4.47	14.77	53.41	0.105	0.139
t quarter 1954	0.45	2.28	4.23	4.78	14.89	47.52	0.092	0.126
d quarter 1954	0.38	2.09	4.29	5.18	14.28	47.12	0.093	0.114

Jntreated rock base substituted for crusher run base at this point.

Long Beach Freeway

Continued from page 31 . . .

Centrally located on the project, between Olive Street north of Atlantic Boulevard and the Pacific Electric Railway tracks north of Rosecrans Avenue, the established location of the freeway is partially within the right-of-way area owned by the Los Angeles County Flood Control District. This position for the freeway cannot be occupied until the Los Angeles River channel has been reconstructed to final location, grade and cross section. The utilization of this portion of the county's right of way for the Harbor Freeway was first suggested by representatives of the Los Angeles County Flood Control District and has resulted in very substantial savings to the State in right-of-way costs. In connection with construction contracts carried out by the City of Long Beach and the Los Angeles County Flood Control District that have contained items of work which provide construction essential to the development of the freeway, cooperative agreements have been worked out covering the split in the financing so that the State would pay its proportionate share of the work being done directly to further freeway construction.

In the negotiations carried out by the State Division of Highways with others in connection with the development of the Long Beach Freeway, excellent cooperation has been received not only from the City of Long Beach and the Los Angeles County Flood Control District, but also from various other departments of Los Angeles County, the Los Angeles City Bureau of Power and Light, the Cities of Maywood, Lynwood, South Gate and Compton, the Southern California Edison Company, the Standard Oil Company, the Richfield Oil Company, and the Los Angeles Junction Railway. Freeway plans have required extensive revisions in the trackage of the Los Angeles Junction Railway serving the East Los Angeles industrial area.

The original design of the Long Beach Freeway was predicated on a freeway agreement executed in 1948. The rapid development of the area between Del Amo Boulevard and Long Beach Boulevard indicated the necessity for additional interchange facilities at Del Amo Boulevard. The proposal for additional facilities at this location has been approved by State Highway Engineer G. T. McCoy. However, until the bridge across the Los Angeles River has been raised, it will not be practical to provide additional traffic interchange facilities on the east side of the freeway. At the crossing with Pacific Coast Highway the U. S. Corps of Engineers proposes to raise the channel levees of the Los Angeles River approximately 10 feet. This will require the construction of a new bridge for Pacific Coast Highway across Los Angeles River, and will also require revisions of the easterly portion of the interchange system between Long Beach Freeway and Pacific Coast Highway that are now being designed.

Byron L. Green, Senior Highway Engineer, is in immediate charge of design work for the Long Beach Freeway.

Right of Way

By L. P. FRIEL, Senior Right of Way Agent

The necessary right of way required for the construction of the Long Beach Freeway comprises approximately 1,100 parcels of real estate, a substantial portion of which is located in the heart of the Central Manufacturing District, one of the largest built-up heavy industrial areas in the State. The total estimated cost of right of way in connection therewith aggregates approximately $17,000,000, and of the 1,100 parcels required, over 950 have so far been acquired by the District VII right of way staff.

These parcels include practically every conceivable type of property among which are oil refineries, brake-shoe companies, tractor and farm machinery equipment plants, lumber yards, junk yards, churches, schools, cemeteries, steel plants, oil wells, and even a quite substantial portion of the United States Air Corps depot.

Early state acquisition of right of way for the freeway in this area eliminated many industrial sites. The result of this scarcity, created by our own purchase was reflected in an increase in market value of parcels remaining to be acquired.

Most of the right of way located in the industrial section necessitated the relocation of fantastic networks of railroad and utility facilities and it should be emphasized that this could only have been accomplished with the wholehearted support and cooperation which we received from all the railroads, various utility companies and from Los Angeles Flood Control District.

We are in the process of negotiating for the acquisition of approximately 150 parcels required for the ultimate completion of this freeway. Some of these remaining parcels are in the central manufacturing district and in the Compton, Bell Gardens and Lynwood areas.

Construction by City Of Long Beach

By JESS D. GILKERSON
City Engineer

The extension of the freeway southerly from Pacific Coast Highway (Route 60) in Long Beach merits special mention because it is one of th few cases where a local agency an not the State Division of Highway is financing a modern freeway. Th condition, of course, results from th fact that the southerly terminus c the freeway (Route 167) as a stat highway is Pacific Coast Highway.

The early completion of the fre way, which will ultimately provic for a high-speed through artery b tween Los Angeles and Long Beac the two largest cities in Los Angel County, is expected to have a terrif traffic impact at the southerly te minus of the freeway. In an attem to devise an adequate means of d tributing this traffic into our harb and business districts, the city had report on "Traffic Distributors in t Central Area" made for it in Febr ary, 1953, by The DeLeuw Cather Company, Engineers, Chicago, Illinc This study indicated the need fo separation in the major traffic mov ments into the business district e of the river from the harbor traf by means of a diagonal bridge in general vicinity of Ninth Street. further contemplated a one-way str ystem east of the Los Angeles River vith added provision for two oneray bridges in the general vicinity of Broadway and Third Street over the Los Angeles River.

The general problem of construcion is complicated by the active land ubsidence in this area which has aleady resulted in seven feet of settleent in the vicinity of Ocean Bouleard and with an additional predicted ltimate subsidence of some 11 feet t this point.

To reduce the flood hazard created y land subsidence, the Army Engieers, in their major flood control imrovement program, have just finished aising the levees approximately 13 eet south of Seventh Street. They lso have under contract with Guy . Atkinson Company a similar levee nprovement program which includes aising the levees an almost comparble amount as far north as 20th treet. This levee raising has compliated, as well as increased costwise, e relocation of the utilities and conruction of roadways and bridges in is entire area.

The following is a brief resume of e status of improvements underken by the city in connection with e freeway project:

The city on June 1, 1953, comleted, with a temporary connection Seventh Street, the section between naheim Street and Pacific Coast lighway, which section is open to affic as a six-lane divided freeway. his section included approximately 115,000 for purchase of rights of ay, $155,000 to Bodum Construction ompany for paving improvements nd approximately $15,000 for safety ghting, as well as $125,000 for storm ain pump station construction by ardner & McCall.

The city, likewise, opened to traf: on July 31, 1953, the Anaheim treet Bridge over the flood control annel, a $2,000,000 construction ontract involving the Harbor Deartment of the City and Guy F. tkinson Company. This project inuded a complete cloverleaf-type terchange with the Long Beach eeway.

In March, 1953, work was started the piers for the Ninth to Seventh Street Bridge at an estimated cost of $800,000. It is expected that the bridge proper and the approaches will ultimately cost $6,500,000 for construction with more than an additional million dollars for rights of way. The acquisition of rights of way on the west side is virtually complete, and it is expected that construction on the west approach and bridge proper will be under way in October of this year. The target date for finishing the entire bridge, including the east approach, is January, 1957.

The present Seventh Street Bridge is scheduled for demolition by Guy F. Atkinson Company in January of 1955 under the Army Flood Control Program. The utilities presently carried on the Seventh Street span are to be reinstalled on a utility bridge currently under construction also by Guy F. Atkinson Company. Similarly, the Pacific Electric Railway will be relocated on a special railway trestle under construction just north of Third Street across the Los Angeles River. Vehicular traffic currently carried over the Seventh Street Bridge will have to be diverted to Anaheim Street and Broadway prior to completion of the Ninth Street structure.

The existing Ocean Boulevard Bridge was shifted downstream to Santa Cruz Avenue on May 29, 1953, at a cost of $276,000 and is serving as a four-lane detour for the new Ocean Boulevard Bridge, also under construction. The piers, which were started in 1953, for this bridge should be finished in August, 1954, at a cost approximating $700,000. Condemnation proceedings have already been instituted for acquisition of rights of way for the west approach to this new structure. It is hoped that acquisition will be completed so that bids for the construction of the bridge proper and approaches can be invited in January, 1955. The construction of this bridge, estimated to cost approximately $7,500,000 including rights of way, is scheduled for a January 1, 1957, completion date.

Coincidentally with the construction of these bridges, the city has the problem of constructing a six-lane divided freeway along the west side of the river from Ninth Street south into the harbor district in an area where the land must be raised from 12 to 15 feet. This artery, which is to serve the harbor, is estimated to cost in excess of $6,000,000. Construction is expected to start in January of 1955 and probably will not be completed until 1958.

On the east side of the river, the terminal facilities for the freeway will be handled by the construction of the DeForest Avenue project from Ocean Boulevard to Seventh Street. The Ninth Street Bridge will terminate on the east side of the channel at Seventh Street in a rather elaborate three-level interchange. It is expected that the DeForest Avenue project, which will provide for an integration of the freeway traffic into a one-way street pattern of the intervening streets between Ocean Boulevard and Eighth Street, will cost approximately $5,000,000. This construction, which will be financed in part by gasoline tax for major city streets and in the major part with tideland oil funds, is also scheduled for completion by January 1, 1957.

When one attempts to add up the figures in connection with this very expensive improvement program, the amount appears almost staggering. A major portion of this complex financing will be defrayed from Long Beach Harbor and General City funds. However, the Los Angeles County Flood Control District will participate in financing the replacement, in kind, of the bridges required to be reconstructed as a part of the Army Engineers' Flood Control Program.

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November-December, 1952, story by W. L. Fahey, District Engineer. See page 9.

July-August, 1953, story By E. T. Telford, District Engineer. See pages 17-23.

January-February, 1954, story by Paul O. Harding, Assistant State Highway Engineer. See page 14.

Safety Record

Continued from page 41 . . .

equal reactions, kinetic energy, etc., these fundamental factors of driving become more impressive to the operator. Even though drivers may not clearly understand the demonstration, and we try sincerely to make the demonstration as simple as possible so that it will be understood, a positive psychological impact is made.

Better Drivers

Having been exposed to these driver problems, we find that drivers are more alert to conditions of the road, use better judgment of motion or clearance of other vehicles or objects, give greater forethought to their driving and its possibilities and appreciate to a greater extent the hazards of following too closely or driving too fast for conditions.

The record of the year 1953 convinces us that the program sponsored by the Division Safety Committee is effective in that it is improving driving habits and attitudes of Division of Highways employees. The division committee believes that a continuation of this program will likewise continue to reduce vehicle accidents. The committee is composed of:

R. M. Gillis, Deputy State Highway Engineer and Chairman; G. F. Hellesoe, Maintenance Engineer; Victor R. Henley, Attorney; E. E. Sorenson, Principal Equipment Engineer; and Chas. T. Waite, Assistant State Highway Engineer. The author is Secretary of the Division Safety Committee. Carroll T. Berry is Field Representative for the Safety Section.

Harbor Freeway

Continued from page 48 . . .

The two main features contributing to the rapid completion of the bridge construction were the utilization of prefabricated falsework bents and the use over and over again of interior box girder forms. All falsework bent units from 16 feet to 20 feet in length were constructed with heavy 10 x 10-inch timbers, each unit consisting of four posts about 12 feet in height, with heavy sill and double cap well-doweled, bolted and braced. Four 20-ton screw jacks were installed at the top on each post between the double caps in each falsework bent unit to facilitate adjustment to the proper grade. Upon completion of one bridge section, as was the case at Washington Boulevard, the entire deck was lowered on the jacks and falsework shifted on rollers into position for the next structure. A number of the above described falsework units were available to construct about one-half of the Figueroa Street structure.

Pouring girder stems and slabs was accomplished with bottom dump bucket and P & H truck crane using an 80-foot boom, working from the adjacent frame. Usually five days after pouring the girder stems and soffit slab of the box girder span, interior forms were unbolted, lifted out and spotted for the next section of girder stems in the adjacent bridge frame. This required careful coordination in placing falsework, decking and reinforcing steel for the girders.

Figueroa Street Structure

The cost of Figueroa Street structure approximates $500,000, including the removal of 4,400 cubic yards of roadway excavation, 8,600 cubic yards of structure excavation and backfill, 5,600 cubic yards of structure concrete, 1,500 linear feet of rubber water-stop, 9,600 pounds of miscellaneous steel and 600 tons of bar reinforcing steel.

The freeway bridges and major structures on this contract were designed under general supervision of F. W. Panhorst, Assistant State Highway Engineer. On the contract, H. F. Belford is Resident Engineer and W. A. McIntyre is Bridge Department representative. The prime contract[or] is the Oberg Bros. Construction Co[m]pany of Inglewood, with Oscar Kri[...]glen the general construction superi[n]tendent.

Hawaiian Roads

Continued from page 33 . . .

better acquainted with the Navy's role in safeguarding national security. Guests were briefed each day on various phases of carrier operation and life aboard ship, and witnessed exhibitions of airplane maneuvering during daylight and blackout conditions, gunnery practice, and other carrie[r] activities.

A similar program was arranged i[n] connection with Naval and Marin[e] installations on the Island of Oahu. The visit to Pearl Harbor included [a] trip to sea on the submarine *U.S.S. Sabalo.*

WOODSON RETIRES

Continued from page 60 . . .

rate, which at that time was not at[]tractive to bond brokers. So in orde[r] to get construction going it was nec[]essary to induce the counties to pur[]chase large blocks by paying a hal[f] cent premium.

Among some of the major project[s] under Woodson's charge were th[e] Yosemite All-Year Highway, Golde[n] State Highway, Tejon Pass, Coaling[a] Kern River, Eastern Sierra, and a[ll] county seat connections throughou[t] the division.

Woodson has been Right of Wa[y] Agent at Bishop, District IX, and wa[s] later transferred to San Francisc[o] taking charge of Right of Way fo[r] District IV.

During periods on annual leav[e] Jim has traveled around the world an[d] visited highways in Germany, Eng[]land, Greece, Italy, France, Tran[s] Jordan, Egypt, Pakistan, India, Sia[m] Malaya, Hong Kong, Japan, Phili[p]pines, Sudan, Uganda, Kenya, Tran[s]vaal, Capetown, Tanganyika, Sout[h] Africa, Belgian Congo, French Equ[a]torial Africa, Portugual, Tangie[r] Spanish Morocco and Spain. He h[as] written a book entitled: *The Visa Ci[r]cuit* which he says may or may n[ot] be any good.

GOODWIN J. KNIGHT

Governor of California

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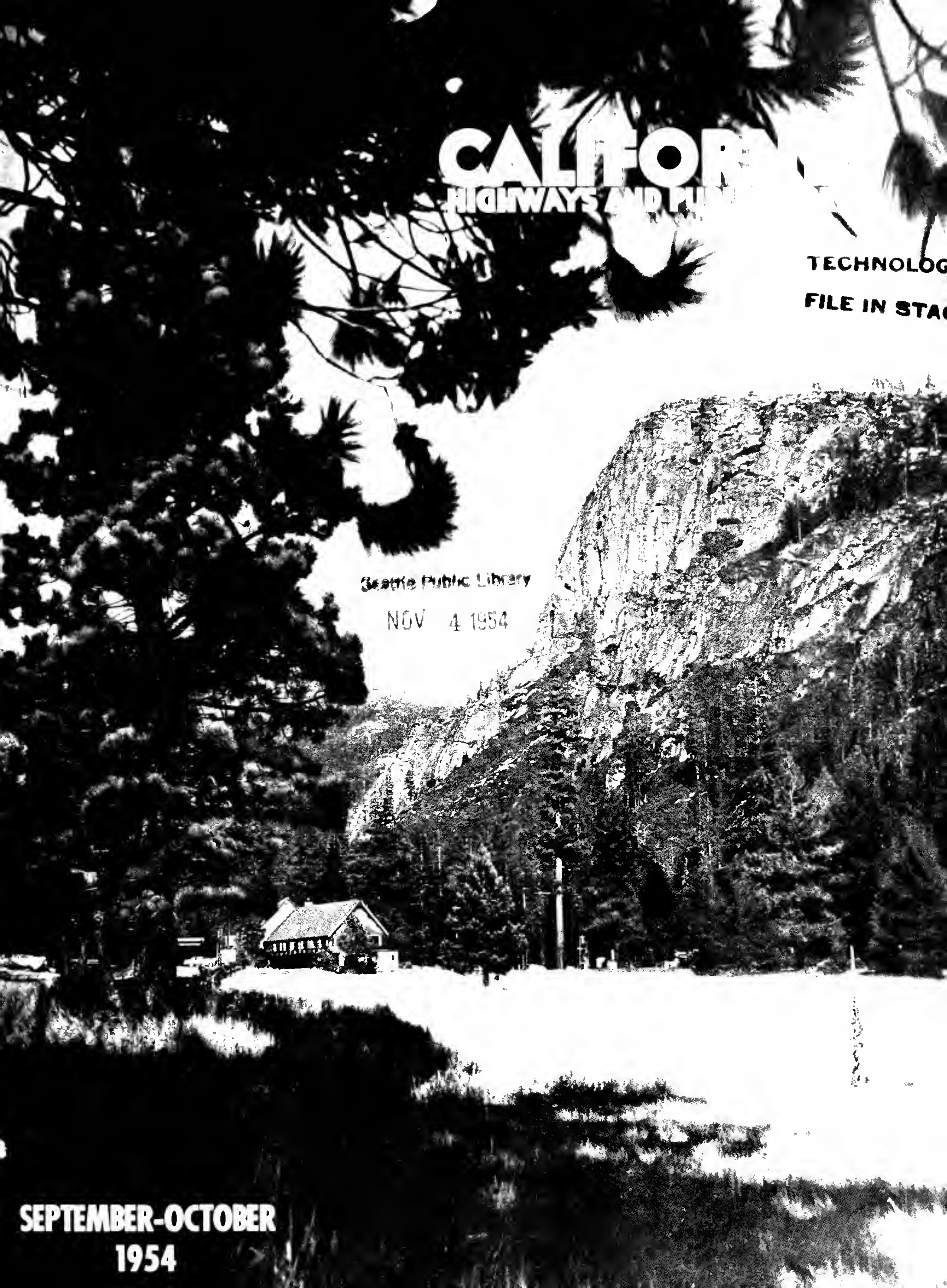

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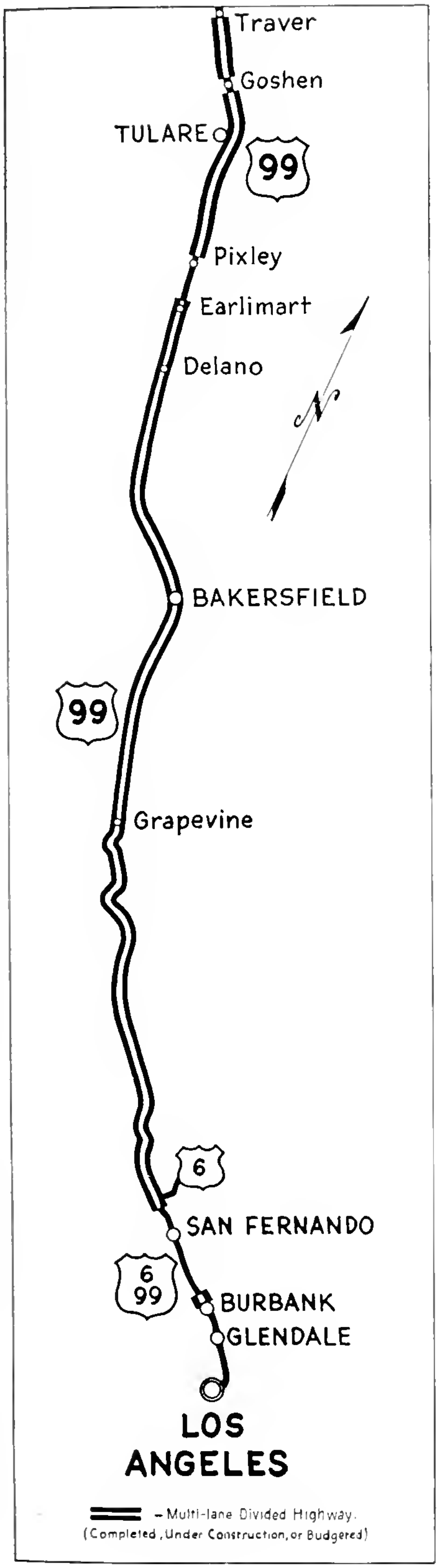
Multilane Sections On US 99

Report of Progress . . .
Los Angeles to Sacramento



THE HEAVIEST traveled portion of US 99, California's great north-south, border-to-border inland highway, is the section between Los Angeles and Sacramento.

This 388-mile stretch, known as the Golden State Highway, bears the brunt of the heavy year-round passenger and commercial traffic traveling between the south state areas beyond the Tehachapi Range and the cities and communities lying along the floor of the Great Central Valley.

The work of converting this section of US 99 to a divided, four-lane expressway or full freeway, which was started before World War II, has been accelerated by the recent increase in the highway user taxes voted by the Legislature.

More than three-fourths of the route either has been or is being constructed to four-lane expressway standards, with much of it as full freeway initially in the larger urban areas and on some mileage in rural areas.

North of Sacramento

US 99 merges with other interstate routes east and south of Los Angeles as far as Indio, with full freeway (Ramona) constructed, under contract or planned in the built-up areas, and expressway in the Riverside County desert sections. North of the Sacramento area, the highway divides into 99E and 99W, both of which are being improved either to freeway standards or as modern two-lane facilities with provision for future expressway

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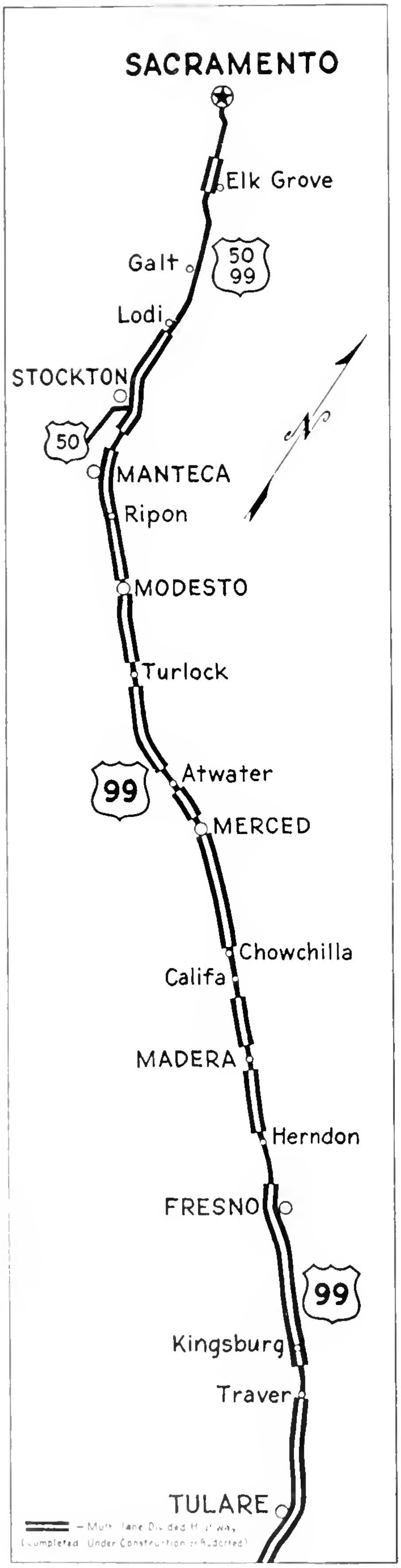
LOWER: Heavy construction on US 99 near Tunnel Station, northwest of San Fernando. View is southeast toward US 6 Junction. CENTER: Looking north across parallel structure of Oildale Overhead north of Bakersfield. UPPER: Looking south along Tulare Bypass Freeway; Route 134 interchange in foreground.



development, as far as Red Bluff. From there to the Oregon border, improvement of US 99 is continuing steadily on both a two-lane and four-lane basis, with sections of freeway and expressway completed or under construction in the area north of Redding and north of Dunsmuir.

During the past 15 years, the Division of Highways has spent more than $50,000,000 in bringing many portions of the Los Angeles-Sacramento section of US 99 up to modern standards with another $14,750,000 worth of work now under construction or scheduled to begin soon on additional expressway and freeway projects.

Los Angeles to San Fernando

At the Los Angeles end, which claims some of the heaviest traffic counts on the entire highway, plans are under way for the eventual construction of a new US 99 freeway from downtown Los Angeles to San Fernando. The routing already has been adopted by the California Highway Commission and right-of-way acquisition has been started.

A mile-long section of multilane, divided highway has already been constructed near the entrance to the Lockheed Air Terminal in North Burbank.

A few miles north of San Fernando, at Tunnel Station, begins the longest stretch of continuous divided, multilane highway in the State. This section, which includes the Ridge Route over the Tehachapis, extends for 117 miles to the Delano Underpass, just south of the Tulare County line.

Additional construction now under way or soon to begin will extend this continuous section another three miles south of Tunnel Station and another 12 miles northward through Delano and as far as Earlimart in Tulare County.

Tulare Freeway

One of the recent major completions along US 99 is the eight-mile

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LOWER: Looking north through Fresno from south end of city, with start of new US 99 freeway curving toward left and clearing for future construction. CENTER: Typical mid-valley section of expressway, looking south from near Turlock. UPPER: Looking northwest toward Manteca on newly completed four-mile section of full freeway; Jack Tone Road Overcrossing in foreground.

Tulare Freeway completed in December, 1953, which takes through traffic well to the east of the old route which was along the business district of the city.

Completion of this freeway means that Tulare County now has a continuous strip of divided, multilane full freeway and expressway from north of Pixley to the Visalia Airport Interchange, a distance of more than 25 miles, and an additional 6.3 miles from north of Goshen to Traver.

In Fresno County a 22-mile section of expressway from south of Kingsburg to south of Fresno is already completed. Through the City of Fresno construction now is under way on the freeway route.

From the Fresno-Madera County line to Modesto, a distance of 70 miles, much of the highway outside of cities already has been reconstructed as divided, multilane expressway.

The Highway Commission recently announced its intention to take under consideration the adoption of a freeway routing through Modesto, and a public hearing was held in that city on September 24th.

Modesto to Manteca

The completed 10-mile expressway section between Modesto and Ripon was extended northward to just south of Manteca by a recently completed 4½-mile full freeway, while construction of the full freeway bypass of the City of Manteca, which got under way in July, 1954, will extend the divided, multilane mileage still another 4½ miles to the north.

Work on converting US 99 to a multilane, divided highway between south of Stockton and Lodi was begun shortly after the end of World War II and completed in 1950. Included in this series of projects was an expressway bypass of the City of Stockton itself which has greatly facilitated the movement of through and local traffic.

US 99 between Stockton and Sacramento also carries US 50 traffic traveling between the San Francisco Bay area and the foothill and high Sierra regions to the east.

Between Lodi and Sacramento plans are now well along for the conversion of the existing two-lane sections to divided, four-lane full freeway.

In Sacramento County, work is scheduled to begin soon on constructing five miles of full freeway between Elk Grove Road and two miles south of Florin Road. This project will connect with the future South Sacramento Freeway for which rights of way are now being acquired.

Long-range Planning

Thus, the long-range planning and the many construction projects of the past decade devoted to the progressive improvement of US 99 are beginning to connect up. The growth of traffic on the more heavily traveled portions of the route have required development of these four-lane divided highways. Until very recently, in the light of available funds as well as traffic needs, most of the construction has been on an expressway basis, with limited private access and with separation structures provided only at the major intersections.

At the same time, it was recognized in the planning and right-of-way acquisition phases of this development that the ultimate need from the standpoint of the safety, convenience and free flow of future traffic on this vital artery would be for a full freeway, with no private access, no left turn movements, and no crossovers at grade. Where intersections at grade have been constructed, provision has been made in recent plans and through right-of-way acquisition to convert these intersections to separated crossings when warranted by traffic needs and permitted by available funds.

There is accordingly foreseeable in the not too distant future a 388-mile continuous ribbon of multilane freeway between Los Angeles and Sacramento, with interchange connections to the valley cities along the route, as a fitting culmination to a portion of California's gigantic highway construction and modernization program which, a bare 15 years ago, was little more than a dream.

→

LOWER: Completed section of US 99 through Weldon Canyon, at southern end of Ridge Route in Los Angeles County. CENTER: Completed structures and grading for freeway interchange at Visalia Airport, north of Tulare; view is south. UPPER: Looking north along the Stockton Bypass; structures are the US 50-99 separation (lower) and the Main Street Overcrossing.

Development of Historic US 50

Improvement Is Being Stepped Up

For variety of scenery, the 238-mile California section of US 50 stands second to no other stretch of highway in the State.

Beginning in historic San Francisco, it passes across the world-famous San Francisco-Oakland Bay Bridge, through the East Bay area, the Great Central Valley of California, the foothill region of gold rush fame, and the spectacular high Sierra country.

For more than a century the route followed by US 50 through the mountains has served as an important connecting route between California and points to the east, and today it is among the few trans-Sierra highways kept open to traffic during the winter months. Sections of US 50 in the East Bay area carry as many as 44,000 vehicles a day. On the portion west of 7,382-foot Echo Summit summer traffic counts run as high as 7,600 a day.

Program Stepped Up

Small wonder, then, that the recently stepped-up highway construction program resulting from the increased highway user taxes voted by the California Legislature has also meant a marked speed-up in the modernization of US 50.

A total of more than $36,000,000, much of it post-World War II, has been spent or obligated thus far on US 50 to construct some 76 miles of divided, multilane highway, plus modern two-lane stretches in the Sierra foothill and mountain area.

On the section between US 101 in San Francisco and the East Bay Distribution Structure (this portion is also the western end of US 40) several projects totaling some $10,000,000 now are under way.

Two Current Jobs

Two current jobs totaling nearly $5,000,000 are for constructing freeway approaches to the west end of the San Francisco-Oakland Bay Bridge between Eighth Street and Third Street in San Francisco. Design provision has been made for tying-in these approaches with the proposed elevated Embarcadero Freeway which will connect with the Golden Gate Bridge (US 101).

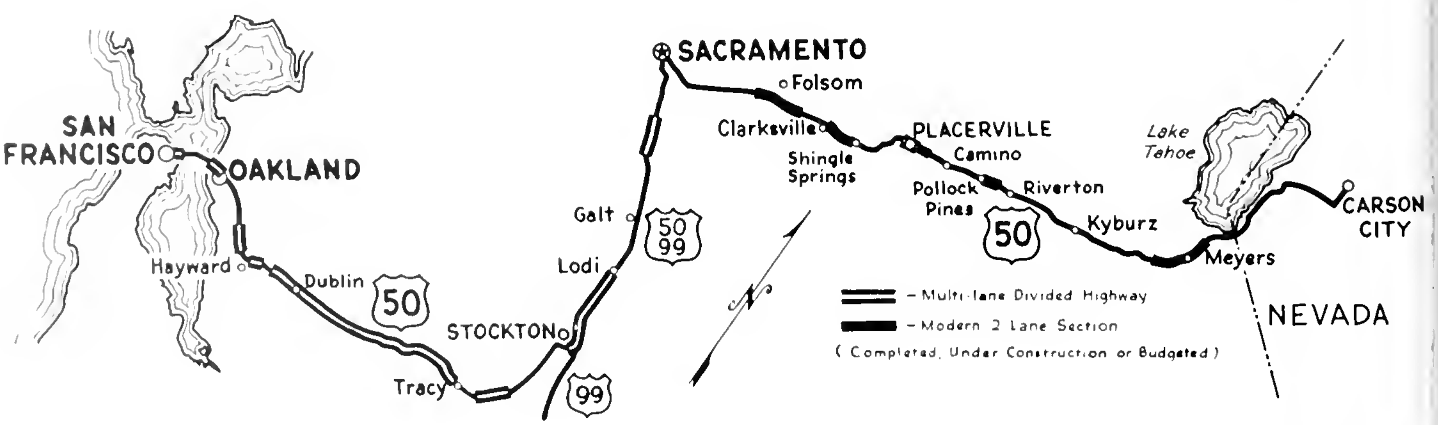
On the Bay Bridge itself, several contracts either recently awarded or scheduled to be advertised during the next few months cover construction of additional ramps on Yerba Buena Island to facilitate the movement of traffic to and from the bridge; the installation of a system of signals on the lower or truck deck of the bridge; and widening and other improvements to the Toll Plaza, involving construction of a new line of on-side toll booths north of the present one and extension of the Port of Oakland overhead structure.

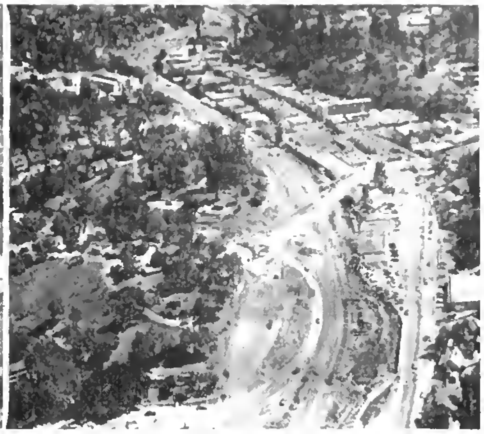
San Francisco-Oakland Bay Bridge

The East Bay Distribution Structure also is undergoing major improvements. A third level and new ramps are being constructed at a cost of more than $4,000,000, to eliminate all cross-weaving traffic.

In the East Bay Metropolitan area surveys are being made and studies are well advanced which will aid in determining a future freeway route for US 50 through Oakland. The California Highway Commission has scheduled a public hearing for November 19, 1954, on a portion of this routing as recommended by the State Highway Engineer.

On US 50 southeast of Oakland a two-mile freeway through Castro Valley was completed in September,





LEFT: East Bay Distribution Structure, showing pier construction for additional ramps under way; Bay Bridge toll plaza in background is also being improved. CENTER: Looking east toward Dublin Canyon on newly opened Castro Valley Freeway former US 50 Route curving toward left. RIGHT: Looking easterly along route of Placerville expressway, showing construction operations.

while farther east in Alameda and western San Joaquin Counties the final work of paving a 7½-mile expressway from the Altamont Pass to just west of Tracy now is under way.

Sacramento-Lodi Freeway

Completion of the Altamont-Tracy job will mean a continuous stretch of multilane, divided highway from west of Dublin to Tracy, a distance of 31 miles. East of Tracy, there is an expressway section four miles long between Grant Line Road and the San Joaquin River at Mossdale.

US 50-99 from Stockton north to Lodi already has been constructed as divided, four-lane highway, including an expressway bypass of the City of Stockton.

Between Lodi and Sacramento plans are being prepared for converting the existing two-lane sections of US 50-99 to a four-lane full freeway.

South of Sacramento work is scheduled to begin soon on constructing five miles of the route as a four-lane full freeway between one-half mile south of Elk Grove Road and two miles south of Florin Road. This project will tie into the proposed South Sacramento Freeway, for which some rights of way are now being acquired.

East of Sacramento, the seven-mile Folsom Bypass, completed in 1949, has shortened the traveling distance by nearly three miles.

Sierra Foothills

In the Sierra foothill region to the east, work was recently started to eliminate five miles of curve-filled road along US 50 between Clarksville and Shingle Springs in El Dorado County. Although initially to be constructed as a modern, two-lane highway, provision has been made in the design and enough right of way acquired so that a second parallel roadway can be constructed sometime in the future to convert the highway into a divided, four-lane expressway.

In historic Placerville, work also is progressing rapidly on the freeway through the city. This mile and a half of divided highway, with five vehicular and pedestrian separation structures, will, after its completion next year, facilitate the movement of both through and local traffic.

The two-mile section from Placerville east to Five-mile Terrace was straightened and widened in 1951.

Among mountain sections of US 50 slated for future improvement as soon as funds are available is the three-mile portion between Five-mile Terrace and Camino, for which an improved routing was adopted and declared a freeway by the Highway Commission in July, 1954.

Old Tahoe Wagon Road

For 60 years or more the general route followed by US 50 east of Placerville was the main road for travelers crossing the Sierra. Some construction work was begun by the county in the late 1850's. In the early sixties the route was improved and operated by several private toll road companies until it was purchased by the county around 1880. Long known as the Tahoe Wagon Road, the route became California's first state road on February 28, 1895.

In the high Sierra many of the major improvement jobs along US 50 since World War II, have been forest highway projects constructed by the U. S. Bureau of Public Roads.

These include the widening and straightening of three miles of highway between Pollock Pines and Fresh Pond, completed in 1947; the construction of a new highway replacing the old horseshoe curves on Meyers Grade east of Echo Summit, also completed in 1947; and a six-mile widening and straightening job between the foot of Meyers Grade and Tahoe Valley, completed in 1950.

To date, including projects prior to World War II, the U. S. Bureau of Public Roads has expended more than $2,500,000 of forest highway funds on improving 42 miles of US 50 between Pollock Pines and the Nevada state line.

Expressway relocation of US 50 looking easterly toward Tracy, nearing completion. Delta-Mendota Canal of Central Valleys Project in foreground.

US 40

New Route in Contra Costa County Will Cost Millions

The Division of Highways is advertising for bids on construction of nearly five miles of six-lane freeway on a new route for the Contra Costa County portion of US 40.

The state highway budget carries an allocation of $6,000,000 for the work, the largest budgeted amount for a single project in Northern California highway history.

Bids have been asked for grading, paving and structures on 4.8 miles of full freeway from Santa Clara Street about 0.2 mile southerly from Jefferson Avenue to south of County Road 24 to take US 40 traffic off a portion of crowded San Pablo Avenue now carrying an average traffic volume of over 35,000 vehicles daily.

Two Structures

In addition to the work now being advertised, a $355,000 contract is nearly completed for two structures on the freeway route, one an overhead crossing of the Santa Fe Railway tracks at 47th Street in Richmond and the other a crossing of San Pablo Creek near the north city limits of San Pablo. The railroad overhead will provide two 36-foot roadways separated with a 12-foot median strip. San Pablo Creek will be crossed on a 530-foot long reinforced concrete arch culvert providing a waterway area 20 feet wide and 19 feet high.

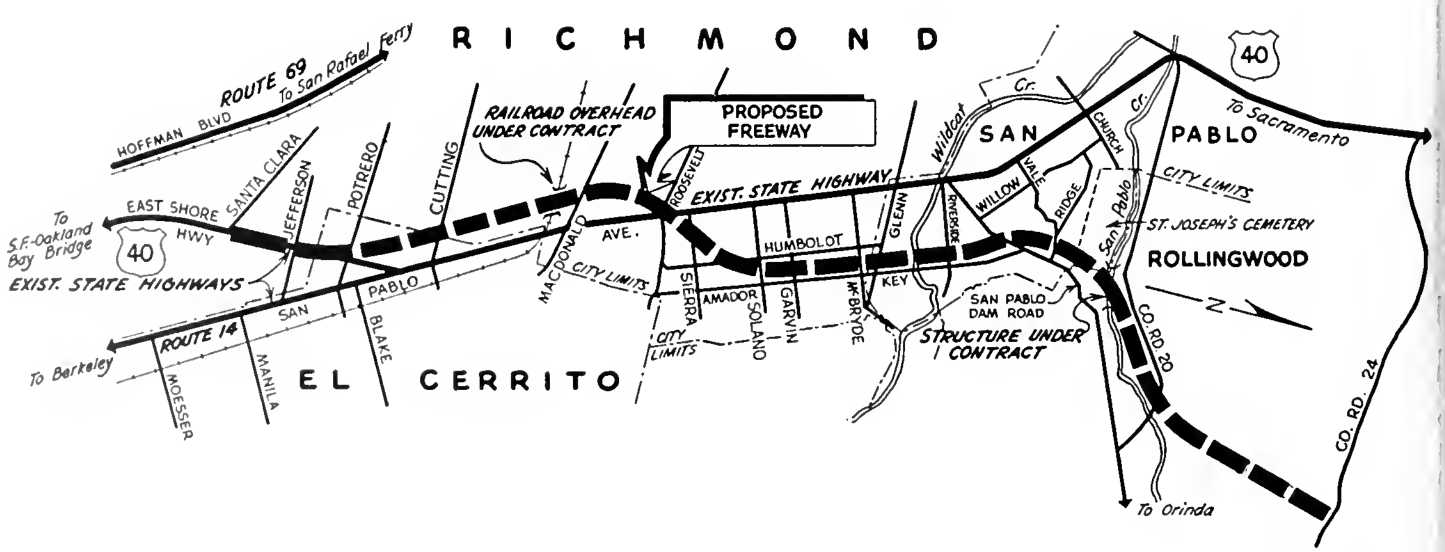
Starting on the existing highway at Santa Clara Street, the freeway construction project will extend through Richmond, a portion of El Cerrito and San Pablo and swing around the Rollingwood and Willart Subdivisions to south of County Road 24 near the Standard Oil Company tank farm.

Runs Just West of San Pablo

From the beginning of the project to Roosevelt Avenue the freeway will run just west of and parallel to San Pablo Avenue. At Roosevelt Avenue the alignment curves across San Pablo Avenue, which will be spanned with a box girder structure and connected to the freeway with traffic interchange ramps, and extends to Key Boulevard.

Westerly of San Pablo Avenue the freeway will be elevated, and easterly of San Pablo Avenue it will be depressed until the crossing of San Pablo Creek. In addition to the San Pablo Avenue and railway separation structures, grade separations will also be provided at Potrero Avenue, Cutting Boulevard, MacDonald Avenue and Barrett Avenue where local traffic may pass under the freeway and also have access to and from the freeway on interchange ramps. Through the area of the depressed freeway Solano Avenue, McBryde Avenue and San Pablo Dam Road will have overcrossing structures for local traffic which will also have access to and from the freeway on interchange ramps. After leaving San Pablo Creek the freeway crosses above County Road 20, which will be slightly realigned.

With the completion of construction the portion of the freeway from Santa Clara Street to the interchange at San Pablo Avenue will be opened to through traffic and the portion easterly of San Pablo Avenue to County Road 20 opened to local traffic. Opening of the entire construction to through traffic will depend on the availability of future state highway funds for construction of the necessary link to connect the new freeway with the existing highway northeasterly between Hercules and Rodeo.



Hollywood Freeway

Project Is Truly Cooperative Effort

By A. D. GRIFFIN, Assistant District Engineer, District VII *

Acting upon the recommendation and certification of George T. McCoy, State Highway Engineer, that the last major construction unit of the Hollywood Freeway, a portion of State Highway Route 2 (US 101) covering work between Hollywood Boulevard and Pilgrimage Bridge had been completed under contract with the Bongiovanni Construction Company of Los Angeles, Frank B. Durkee, California Director of Public Works, on August 5, 1954, accepted this contract in the name of the State of California.

One might say this writes "finis" to this 10-mile $55,000,000 freeway extending from Vineland Avenue in Fernando Valley to Spring Street in the Los Angeles Civic Center and brings to a close a cooperative project of first magnitude that represents the consummation of joint effort on the part of many governmental agencies, civic organizations and individuals.

Future Work

However, although the major construction on the Hollywood Freeway can now be regarded as completed, there will be further construction operations in progress from time to time in the future as may be found necessary. Erosion control planting, some of which is now in progress, remains to be carried out, some additional signing and lighting may be required, and the customary state highway maintenance must continue indefinitely. So it is impossible to say that the work on the Hollywood Freeway is even now completely finished and that we can go away and forget about it.

While many fine comprehensive stories about the Hollywood Freeway have appeared in newspapers and magazines, and technical reports have been written covering special features, it is perhaps now in order that an informal final report be made to cover the project as a whole and bring together in one place salient features and factual information concerning this freeway.

A. D. GRIFFIN

No one can question the importance of the Hollywood Freeway because recent traffic counts, indicating some 168,000 vehicles per day using the section between Vermont Avenue and the four-level interchange structure, show it to be the most heavily traveled traffic arterial in the world. Anyone traveling this freeway today gains the impression from the broad right of way upon which he is traveling that this project did not involve too many problems. Those, however, who have seen the progress through all phases from beginning to end realize that there were many difficulties involved. It is quite probable, however, that even these citizens do not fully comprehend the tremendous cooperative effort required to bring a project of this nature to full completion. This is an attempt to pay tribute to those who have had some part, be it large or small, in making this project possible.

Historical

The pressing need for a new highway arterial between the Los Angeles downtown area and the San Fernando Valley to supplement the existing congested city streets was quite generally recognized even some 30 years ago, when a diagonal route roughly paralleling the present route of the Hollywood Freeway was included as a unit of the Major Traffic Street Plan of the City of Los Angeles. This program was submitted to, and approved by, the voters, at the general election in 1924.

One of the first published reports that served to focus attention on the great need for freeways in the Los Angeles area was the "Traffic Survey, Los Angeles Metropolitan Area," released by the Engineering Department of the Southern California Automobile Club dated April 16, 1937. The concept of freeways as we know them today was generally described in this report, although the freeway type of highway arterials as proposed were called "motorways."

Later under date of December 7, 1939, a more comprehensive report was made to Mayor Fletcher Bowron and the City Council of Los Angeles by the City of Los Angeles Transportation Engineering Board.

Report on Transit Program

In this report entitled, "A Transit Program for the Los Angeles Metropolitan Area," a new highway arterial between the San Fernando Valley and the Los Angeles downtown area was mapped and referred to as the "Hollywood Parkway." Another proposed new highway arterial in this report was described as the "Santa Monica Parkway." The "Hollywood Freeway," as we know it today, follows in a general way the routing proposed

* One of the oldest engineering employees from standpoint of service with District VII, his name first appearing on the pay roll as a maintenance crew laborer in 1915, A. D. Griffin has been requested to write this roundup story of the Hollywood Freeway, because he has been with District VII continuously since 1921, through the entire period during which this freeway was undertaken.

Looking southeasterly along Hollywood Freeway from Wilton Avenue Bridge showing Hollywood Boulevard Overcrossing

in this report for the "Hollywood Parkway" from Vineland Avenue to Vermont Avenue, and for the "Santa Monica Parkway" from Vermont Avenue to the Los Angeles Civic Center. It is to be noted that in this report credit is given to the cooperating agencies as follows: Los Angeles Traffic Association, Central Business District Association, Los Angeles County Regional Planning Commission, and the Auto Club of Southern California.

Another important publication which emphasized the importance of early completion of the Hollywood Freeway, was the report by the Los Angeles Metropolitan Parkway Engineering Committee dated March 30, 1946, entitled, "Inter-regional, Regional, Metropolitan Parkways." This report gave valuable information to Senator Randolph Collier's *Joint Fact-finding Committee on Highways, Streets and Bridges of the California Legislature.* This report listed as cooperating agencies the following: County of Los Angeles, Cities of Los Angeles County, Automobile Club of Southern California, Los Angeles Traffic Association, California State Chamber of Commerce, Los Angeles Chamber of Commerce, Central Business District Association, and the Downtown Business Men's Association.

The recommendations in this report and the facts and statistics printed therein were of great value to the California Legislature in its deliberations prior to the adoption of the Collier-Burns Highway Act of 1947, the passage of which greatly increased state highway funds available for freeway construction. Without the additional funds provided by this act, the Hollywood Freeway would not stand completed today.

Freeway Becomes State Responsibility

The Collier-Burns Act discontinued as such the one-fourth cent of gas tax previously allocated to state highway routes through cities. In the over-all additional financing which it provided, it passed the complete responsibility to the State of California for constructing and maintaining all state

View of four level grade separation structure taken at night. On the lower level the light streaks on the right are approaching headlights and the fainter light streaks on the left are receding tail lights.

highways through all cities within the State.

Collier-Burns Money

When money first became available under the Collier-Burns Highway Act of 1947, due to the freeway agreements in effect between Los Angeles City and the State, Charles H. Purcell, then Director of Public Works, expressed the desire not only for the early completion of the Hollywood Freeway, but also the completion at the same time of the portion of the Harbor Freeway extending from the four-level interchange structure to Olympic Boulevard. He felt that this portion of the Harbor Freeway should be completed at the same time, or if possible, at an even earlier date, because this unit was of vital importance in the distribution of Hollywood Freeway traffic to and from the Los Angeles downtown area. The Hollywood Freeway and this portion of the Harbor Freeway would also have, by means of the four-level interchange system, direct connections with the Arroyo Seco Freeway, the Santa Ana Freeway and the Ramona Freeway.

Mr. Purcell requested that a detained program of construction for the Hollywood Freeway and the unit of the Harbor Freeway from the four-level structure to Olympic Boulevard be prepared, assuming that adequate funds would be available for construction just as soon as plans could be completed and rights of way obtained. A similar program was requested, taking into account the availability of financing as finally provided by the Collier-Burns Highway Act of 1947. It is interesting to note that these two studies revealed the important fact that had there been unlimited financing, only one year's time could have been saved in getting this part of the freeway system completed and in use by public traffic.

Tribute to Cortelyou

From the start of the planning for the Hollywood Freeway, the main responsibility for securing agreement of all the interested people and getting the work underway fell on Mr. Spencer V. Cortelyou, retired Assistant State Highway Engineer who was in charge of District VII from its inception in 1912 to his retirement in 1949. Mr. Cortelyou well merited the title of "Father of the Hollywood Freeway" graciously bestowed on him by civic groups.

In 1947 when Paul O. Harding was first transferred to this area as a district engineer, one of his first undertakings of an administrative nature was the negotiation of a three-way cooperative agreement between the City of Los Angeles, County of Los Angeles and the State, for the grading of the Civic Center area between Main Street on the east, Grand Avenue on the west, Sunset Boulevard on the north, and Temple Street on the south. This was followed by a four-way agreement with the Pacific Electric Railway Company added as the fourth party to cover the abandonment of the old railway tunnel between Temple Street and Sunset Boulevard and changes in operation of the Pacific Electric.

Cooperative Agreements

These cooperative agreements called for grading of a portion of the old Ft. Moore Hill, the removal of the Broadway Tunnel, removal of the Pacific Electric Railway Tunnel, and provided for the necessary excavation to carry the Hollywood Freeway through the Civic Center. This was the contract that required the hauling of one million yards of excess excavation over city streets to the Bishops Canyon disposal area that had been previously purchased by the State so that it would be available when needed for disposal of excess excavation from freeway construction. The costs were shared about one-third each by the State of California, the City of Los Angeles and the County of Los Angeles, in proportion to the benefits received. The State obtained the cleared area for the Hollywood Freeway, the city secured new and improved locations for city streets and the county got sites for future buildings and parking areas.

In 1949, Harding was appointed the Assistant State Highway Engineer in full charge of District VII and from that time on he and his staff had the responsibility for advancing the Hollywood Freeway to completion.

Location and Design

The Bureau of Engineering of the City of Los Angeles during the early years of World War II cooperated with the State Division of Highways in establishing the general routing for the Hollywood Freeway. Aerial mosaic photographs of the entire route were studied extensively in order to establish the center line of the Hollywood Freeway so that it would be as direct as possible and yet clear expensive structures that would have greatly increased the cost of right-of-way acquisition. As a result of these joint studies between engineering staffs of the city and the State, the late C. H. Purcell, then State Highway Engineer and later State Director of Public Works, presented a portion of the Hollywood Freeway route for consideration of the California Highway Commission. Later, the remainder of this freeway was presented to the commission for consideration, and on the dates January 27, 1941; May 25, 1943; January 20, 1944, and October 18, 1945, the Highway Commission adopted various sections of the Hollywood Freeway as portions of State Highway Route 2 in the City of Los Angeles. These actions by the Highway Commission made it possible for the State Division of Highways to go forward with detailed engineering plans to proceed with right-of-way acquisition and to advertise and award construction contracts.

Freeway Agreement

Following freeway route adoptions by the Highway Commission, state law requires that before actual construction is started the State shall enter into a freeway agreement with the city in which the freeway is located. This freeway agreement sets forth that the State and the city are in accord as to the proposed changes in the existing city street pattern because of the freeway. In the case of the Hollywood Freeway, the first freeway agreement was executed two days before Pearl Harbor on December 5, 1941, following its approval by the Los Angeles City Coun-

Looking westerly along Hollywood Freeway with Civic Center in foreground, San Fernando Valley in background. Arroyo Seco Freeway extends to the right from the four level structure and the Harbor Freeway extends to the left.

cil. The council has always been very cooperative in expeditiously handling all matters concerning the construction of freeways by the State within the city. Its freeway-mindedness is shown by the fact that it adopted an official freeway plan for the City of Los Angeles in 1946 which included the Hollywood Freeway in its entirety as well as other state highway freeway routes.

The State, County and Federal Affairs Committee of the City Council is the official liaison unit of the city council with all other public agencies involved with which the city deals. This committee was most helpful in all of the negotiation phases and in many design and construction problems attendant on a project of this magnitude.

First Units

Because of the limited availability of engineering personnel during World War II it was agreed that design responsibility for certain portions of the Hollywood Freeway would be undertaken by the Los Angeles City Engineer's staff. Under the direction of Aldrich, the City Engineer's Office prepared complete contract drawings for later state construction, for the unit of Hollywood Freeway between Barham Boulevard and Vineland Avenue and another unit through the Civic Center from Grand Avenue to Los Angeles Street including the Grand Avenue, Broadway, Spring Street, Main Street and Los Angeles Street bridge separations.

It should be noted here that during the years 1937 to 1940 the City of Los Angeles prepared plans and carried out the construction contract to build the first unit of the Hollywood Freeway through Cahuenga Pass from Highland Avenue to Barham Boulevard. This construction was jointly financed, with the city providing a major portion of the funds with contributions by the State and the Federal Public Works Administration. This one-mile section was completed and opened to traffic during December, 1940. The design of all other units of the Hollywood Freeway was the responsibility of the District VII, Division of Highways, with the City Engineer's Office handling the design details of city street rearrangement, and appurtenant city facilities.

First Design Problem

Perhaps it is in order to say that the planning of the crossing for the Hollywood Freeway with the Arroyo Seco Freeway to the north and the Harbor Freeway to the south presented the first most serious design problem. Many possible solutions were investigated including various types of clover-leaf and three-level designs which all were found to require larger areas for rights of way and involved very considerable amounts of additional travel distance for vehicles making interchange between the freeways. The late W. H. Irish, then District VII Location Engineer, is credited with suggesting the four-level structure and interchange roadway system that was finally developed and built. The structural details for the four-level interchange structure were worked out in the Sacramento Office of the Division of Highways Bridge Department. This was true with all of the bridge structures except those previously mentioned as having been designed by the Bureau of Engineering, City of Los Angeles.

Echo Park Area

Another major project of location and design was through the Echo Park playground area. Solution of the problems presented at this location required that the State reconstruct a baseball diamond, tennis courts and other playground facilities that were interfered with by the freeway and the construction of a pedestrian subway to connect the main portion of Echo Park playground with the area that had been severed. The next problem of interest was the Edgeware Road Fire Department fronting on Temple Street. This situation was met by moving the fire station several hundred feet northerly, turning through an angle of 90 degrees so that it now fronts on Edgeware Road. The design at Sunset Boulevard was influenced by the proximity of the freeway to the then newly constructed KTTV television station.

The design finally adopted for the Hollywood Freeway at the crossing with Vermont Avenue was influenced by the contemplated future construction of the Santa Monica Freeway and also the possibility of rail rapid transit facilities being installed on the future Santa Monica Freeway. This required the lengthening of the Vermont Avenue Bridge and other bridges in the vicinity. The added cost providing for future rail rapid transit facilities was financed by the City of Los Angeles from city funds. Similarly financed from city funds were the bus transfer facilities at Alvarado Street and Vermont Avenue and Western Avenue.

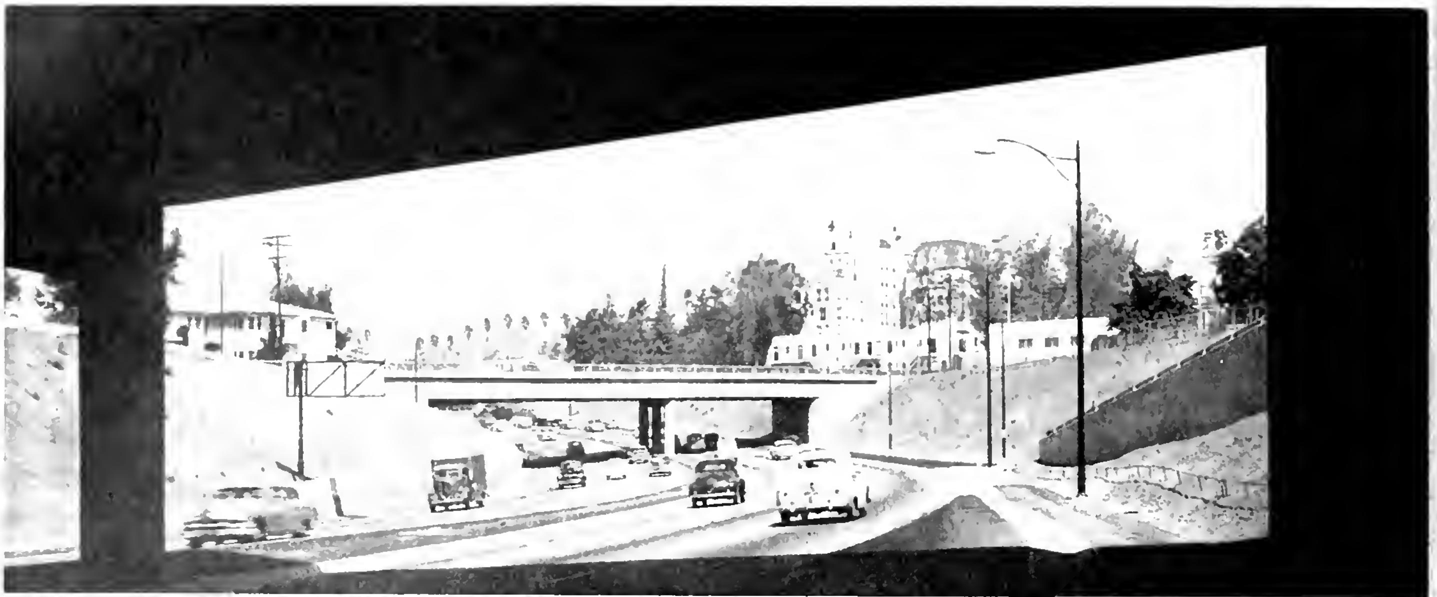
Design Complicated

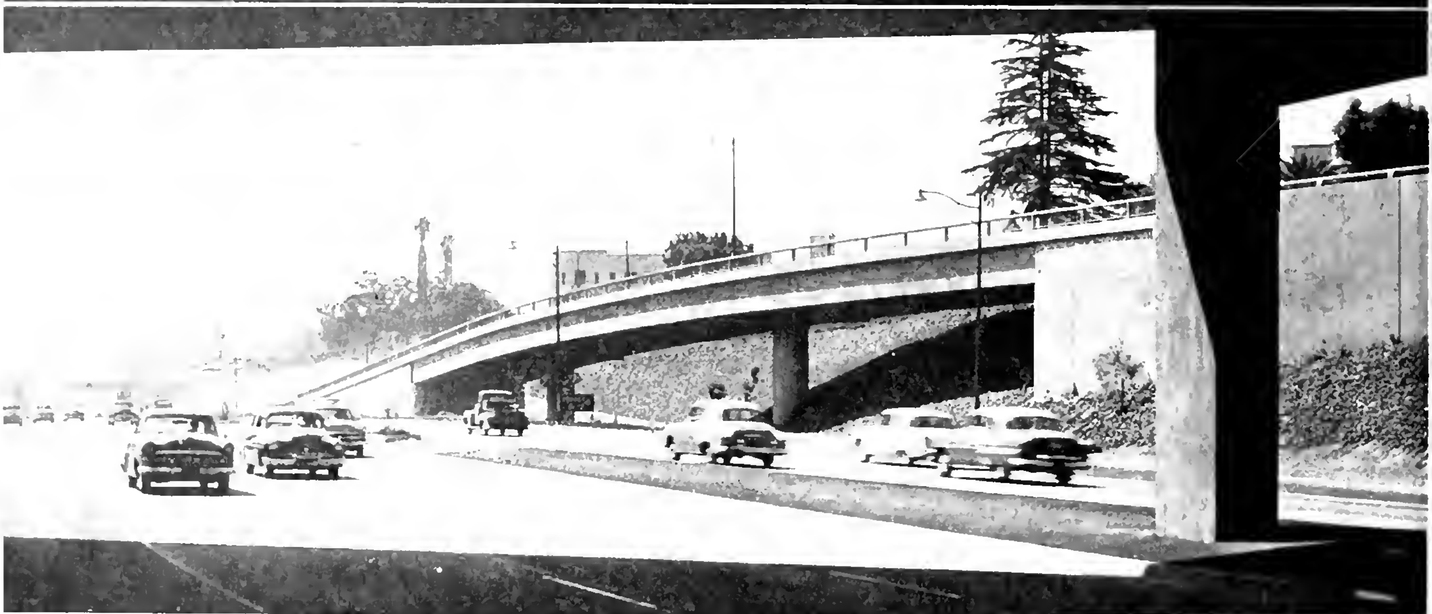
From Hollywood Boulevard to Cahuenga Boulevard the design was complicated by the necessity for avoiding interference with the First Presbyterian Church of Hollywood on the one hand and the Towers Apartment Hotel on the other. In this same area it was necessary to cross Franklin Avenue, a major city street, decidedly substandard in width and having grades in excess of 15 percent. Design studies indicated that it was practicable to reconstruct Franklin Avenue to modern standards and at the same time secure a more economical freeway design. As a result of these studies a cooperative agreement for the improvement of Franklin Avenue as part of the freeway construction was entered into between the City of Los Angeles and the State of California.

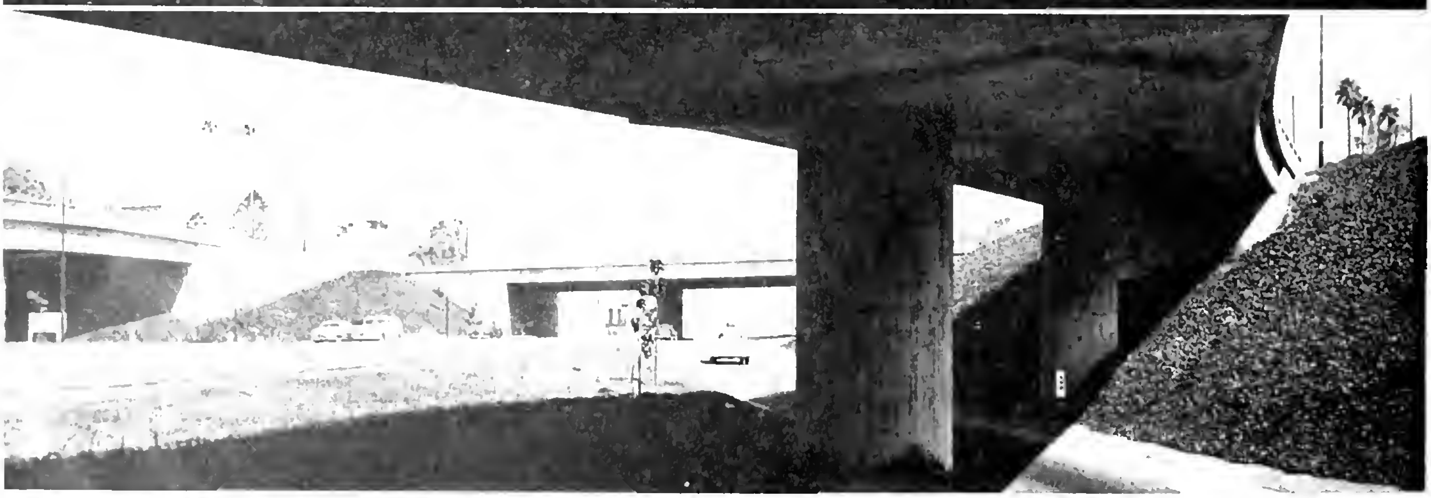
Greatest Center Line Cut

It was interesting to note that in passing through the Whitley Heights area between Cahuenga Boulevard and Highland Avenue the greatest center line cut on this project of 60 feet was made. Whitley Heights is one of the fine old residential sections of Hollywood, and many beautiful homes had to be taken by the freeway. Among these was the "Falcon's Lair" formerly owned and occupied by the late Rudolph Valentino, onetime silent movie star.

Just westerly of Whitley Heights lies the Hollywood Bowl where during summer months "Symphony Un-







UPPER Looking northwesterly along Hollywood Freeway from beneath Hollywood Boulevard Bridge showing Wilton Avenue Overcrossing in center. CENTER—Looking southeasterly along Hollywood Freeway from beneath Hollywood Boulevard Bridge showing Hollywood Boulevard on-ramp overcrossing for in-bound traffic. LOWER Looking northwesterly along Hollywood Freeway from beneath Hollywood Boulevard off-ramp overcrossing bridge.

der the Stars" programs are given every year. The effect of traffic noises that might develop because of the freeway being so close was a matter of grave concern not only to the Hollywood Bowl Association and its patrons but also to the officials of the City of Los Angeles and the State Division of Highways. An acoustic study of the relation of the freeway to the Hollywood Bowl was made by Dr. Verne Knudsen, Professor of Physics and Dean of Graduate Division of the University of California at Los Angeles. Dr. Knudsen, in his report, made certain definite recommendations as to how construction should be carried out on the freeway, and the extent to which landscaping and planting would be needed to reduce possibility of traffic noises reaching the bowl. His recommendations have been followed.

The Hollywood Freeway is now carrying a full load of traffic, and during the current summer season of bowl concerts no complaints have arisen as to adverse effect of the freeway traffic on the bowl concerts even though the final planting program has not yet been carried out. This work is now in progress.

In the design of an extensive freeway project such as the Hollywood Freeway, extending over a period of more than a decade, at one time or another a large number of persons on the engineering staffs of the State Division of Highways and the City of Los Angeles, cooperating together, have been actively engaged on this project.

Right of Way

The first right-of-way acquisition by the State Division of Highways on the Hollywood Freeway dates back to 1942, and since that time an enormous program of negotiations for property has been carried out by the District VII right-of-way staff.

One of the early right-of-way acquisition problems involved the securing of property for the freeway through the Los Angeles Civic Center, the grounds of the Los Angeles City Board of Education, and the Fort Moore Hill area. This right of way was acquired during the war years when there was a critical housing shortage in the Los Angeles metropolitan area. Because of critical housing conditions people could not be evicted from their homes, and the right-of-way area cleared of buildings until new quarters were found for them.

The Hollywood Freeway through the Fort Moore Hill area involved the acquisition of many large and small apartment buildings occupied by people in the low income brackets. The clearing of these improvements out of the right-of-way area so that construction could proceed presented many problems in the securing of other accommodations for the hundreds of people that were affected. The state right-of-way agents were of material assistance in helping these people secure other accommodations within their means, so that evictions by legal processes were avoided.

An important phase of the work of the Right of Way Department is that of handling renting of buildings that are tenant-occupied between the time the property is acquired by the State for right-of-way purposes and the moving or demolition of buildings in advance of construction operations.

Many Buildings Moved

All types of property were acquired for this freeway such as single family residences, large multiple-unit apartment buildings, commercial buildings, and church and school properties. In the right-of-way acquisition activities on the Hollywood Freeway it was necessary to demolish 90 buildings and to move 1,728 buildings.

Before the district right-of-way agents start negotiations with property owners for areas that are needed for rights of way for freeways or other types of state highways the fair market value of each parcel is determined. The appraisal of property is conducted in a detailed, comprehensive manner not only ascertaining all of the salient features of each particular piece of property but also making an extensive search of the records to determine the sale price of comparable or similar properties in that particular neighborhood. It is in this painstaking and careful manner, with the review and approval of the Sacramento headquarters office, that the fair market value of each parcel is determined.

Legal Procedure

If the right-of-way agents after opening negotiations with property owners are unable to reach a satisfactory settlement with them, it is then necessary for the State to resort to condemnation proceedings. Were it not for the right of eminent domain now exercised by governmental authority, public improvements would bog down and many times be impossible to carry out. The right of eminent domain is an important right of the people and its exercise is very necessary in order that state highway projects and freeway projects go forward, otherwise one recalcitrant property owner could hold up a project indefinitely. When a condemnation suit is instituted, the issue is not to determine if the property shall be taken but only to determine how much shall the State pay for it. The necessity for the legal taking of private property by condemnation is certified to by the State Highway Commission in the passing of resolutions to that effect. In the case of the Hollywood Freeway, condemnation proceedings for necessary rights of way were first started in 1942 and continued through the years that followed.

Final Phase of Legal Work

The ribbon-cutting ceremony at the Pilgrimage Bridge April 15, 1954, not only signified the completion of the last link of the Hollywood Freeway but also was coincident with the final phase of all legal proceedings which had spanned a decade.

In 1942 when the acquisition of the necessary rights of way for this project commenced, the State Highway Law Department in Southern California was in truth and fact a one-man organization. During the succeeding years, with cessation of hostilities of World War II and with the passage of the Collier-Burns freeway program, added impetus was given to right-of-way acquisition for the network of our metropolitan freeways, including the Hollywood project.

Since the Hollywood Freeway was instituted, a total of 1,595 parcels were acquired representing a total outlay of $24,918,186.46. Of the total par-

Looking southeasterly along Franklin Avenue in Hollywood showing Franklin Avenue-Argyle Avenue Undercrossing

cels acquired, 74 were involved in litigation either by way of stipulated judgments or contested trials, representing total awards of $1,215,263.92. Thus it may be seen that, aside from numerous legal problems involved, the total litigation represented approximately 5 percent of the number of parcels acquired and approximately 5 percent of the total cost of the right of way.

Utilities

The public utility reconstruction problems along the Hollywood Freeway were unique in that the adopted route intercepted some of the heaviest and most expensive utility installations that can be found in any city in the Country. The State has had excellent cooperation from the Pacific Telephone and Telegraph Company, the Southern California Gas Co., the Pacific Electric Railway Company, the Los Angeles Transit Lines, Los Angeles City Department of Water and Power, and other public utility companies. In District VII the handling of arrangements for moving and reconstructing utilities such as pipelines, power lines and telephone lines is the responsibility of a subdivision of the Right of Way Department called the Right of Way Clearance Section.

When World War II came to a close, permitting construction to get under way, it was decided the areas along the Hollywood Freeway where bridges could be built should be cleared as speedily as possible. Therefore in April, 1945, the first formal notices were sent to the various utilities requesting that reconstruction be carried out in accordance with the state plans where bridges were planned separating the freeway from city streets.

Relocation Work

Prior to the Collier-Burns Act becoming law on January 1, 1948, practically 100 percent of all relocation work by public utilities on the Hollywood Freeway was at the utility's expense. After January 1, 1948, all publicly owned utilities in the freeway area prior to route adoption and freeway declaration were relocated at the State's expense. Correspondingly, privately owned public utilities without contractual obligation to relocate at their own expense were reimbursed by the State for the full cost of relocation.

There were public utility installations of considerable magnitude on many of the important streets crossed by the freeway. On Vermont Avenue where the plans called for a bridge some 600 feet in length over the Hollywood Freeway, there were water, power, telephone, gas and a number of incidental facilities to be temporarily detoured about the proposed structure before construction started. After the bridge reached a certain stage of construction, they were installed permanently in the bridge deck. Of these facilities, the most important and costly were those of the Pacific Telephone and Telegraph Company, amounting to 15 lead-covered cables with corresponding ducts to hold them. Among these were a number of cables over four inches in diameter containing 1,200 pairs of wires.

The work of temporarily relocating during construction was begun about a year and a half prior to the start of

the actual bridge work. The water and power relocations were much a routine operation. The telephone project, however, was unique. The move from the existing location in Vermont Avenue to a position clear of construction was accomplished by splicing in an additional 100-foot length in each of the cables. Then, after breaking away the existing tile duct from around the cables, they were moved by hand, using a crew of about 20 workmen, from the locations in the street to temporary locations beyond construction. Each cable was thus individually moved by hand a distance of about 50 feet laterally throughout the entire length of the bridge excavation.

These various telephone installations included both exchange and toll cables, the toll lines being to points north and east and carrying, among other things, radio and television programs. The splicing operation, both for the temporary move and for the permanent relocation, took about four months to perform, working around the clock. Many of these same cables, including all of the toll cables,

UPPER—Looking southeasterly along Hollywood Freeway from Sunset Boulevard overcrossing bridge. In center is shown the Von Ness Avenue Overcrossing. LOWER—Hollywood Freeway looking southeasterly from Hollywood Boulevard Overcrossing showing Hollywood Boulevard off-ramp overcrossing left and Hollywood Boulevard on-ramp on right.

were encountered a second time at the Santa Monica Overcrossing bridge and again in the construction through Cahuenga Pass.

The approximate cost to the State at Vermont Avenue for utility relocation was $185,000. The total cost of relocating all public utilities on the Hollywood Freeway was $1,905,000. Of this amount the State contributed $1,184,000 and the utilities bore the remainder of the cost, amounting to $721,000.

Construction Program

Many changes have taken place in Cahuenga Pass and in the valleys at both ends during the 44 years since the old Ventura Boulevard through the pass was first paved. The original pavement constructed by Los Angeles County in 1910 was oil macadam built to a steep gradient and on the sharply curving alignment prevailing at that time. With the development of the San Fernando Valley and the phenomenal growth of Hollywood this original pavement which had been the source of much pride in 1910 became inadequate to carry the rapidly increasing traffic load. This area became a part of greater Los Angeles and it was under the engineering department of the city that the pavement through the Cahuenga Pass was rebuilt to improved standards about 30 years ago.

Then again 14 years ago the City of Los Angeles reconstructed the original road through the pass between Highland Avenue and Barham Boulevard converting it into what was then known as the Cahuenga Freeway. This one-mile section of modern eight-lane freeway has now become a part of the Hollywood Freeway for which the limits of completed construction now extend from Vineland Avenue in San Fernando Valley to Spring Street in Los Angeles Civic Center.

First Major Contract

The State Division of Highways awarded its first major construction contract in the development of the Hollywood Freeway on May 28, 1947. This construction provided for the extension of this freeway in a northwesterly direction for 1.8 miles from Barham Boulevard to Vineland Avenue of the eight-lane freeway previously constructed by the city under a city contract. Following this initial freeway construction by the State Division of Highways other contracts have been awarded, making a total of 58 construction contracts. On these state contracts the construction engineering and supervision of contractor's operations have been carried out by resident engineers and their associates.

As will be noted from photographs accompanying this story, bridge structures play a very important part on the Hollywood Freeway. The outstanding structure is the four-level traffic interchange bridge at the junction of the Hollywood Freeway with the Arroyo Seco Freeway and Harbor Freeway. The preliminary investigations for this structure were conducted by the Southern Section of the Bridge Department which has headquarters in Los Angeles.

The other bridge structures on the Hollywood Freeway, excepting those in the Los Angeles Civic Center and in the Cahuenga Pass area that were handled by the City of Los Angeles, were also designed in the Sacramento Office of the State Bridge Department. The local staff of the State Bridge Department worked in close cooperation with the Los Angeles City Engineer's Office in determining the design of bridge structures to fit in with the existing city street pattern and to secure coordination of alignment and grade systems.

Special designs were executed when unusual conditions were faced such as occurred on the Highland Avenue on-ramp overhead for the Hollywood Freeway near the Hollywood Bowl. Instead of open steel railings this bridge was provided with solid para-

View looking northerly along Hollywood Freeway from Pilgrimage Bridge showing Highland off-ramp overcrossing center left. The cleared space between the two main freeway roadways is the strip of land 48 feet wide recently acquired from the Pacific Electric Railway after abandonment and track removal. This additional area will be available for future freeway improvement as needed.

pet walls lined with acoustical tile in order to reduce traffic noise.

The Hollywood Freeway was developed during the regime of three governors who, both in and out of office, were enthusiastic in their hearty support in the furtherance of this freeway. The Hollywood Freeway was initiated during the term of Governor Culbert L. Olsen; was designed and built during the administration of Governor Earl Warren, and finally completed under Governor Goodwin J. Knight.

Great credit is due the nonsalaried members of the California Highway Commission for their continuity of effort in budgeting funds to provide for detailed programing of all phases of this freeway development.

The Hollywood Freeway is a portion of U. S. Highway 101 and the Federal Aid System and special acknowledgment is,in order for the cooperation extended by the U. S. Bureau of Public Roads throughout the years in all phases of location, planning, design and construction and for the assistance provided by federal aid funds.

During the time that the Hollywood Freeway plans were being developed and financing arranged, valuable contributions toward the project were made by many civic and governmental organizations, among which should be mentioned the Los Angeles County Regional Planning Commission, the Los Angeles County Road Department, the Los Angeles County Board of Supervisors, the Los Angeles City Council, Los Angeles County Section of League of California Cities, the Los Angeles Metropolitan Traffic Association, the Central Business District Association, the Downtown Business Men's Association, the Los Angeles Traffic Advisory Board, Los Angeles Section of National Safety Council, the California State Chamber of Commerce, the Hollywood Chamber of Commerce, and the Metropolitan Traffic and Transit Committee of the Los Angeles Chamber of Commerce. The Los Angles chamber was particularly active in the furtherance of the Hollywood Freeway and general matters pertaining to the state highway program.

The Hollywood Freeway has been a cooperative project of great magnitude. Many civic-minded groups and individuals have made the Hollywood Freeway an actuality. Limitation of space makes it impossible to mention all of those who had a part in this accomplishment.

Just released by the Engineering Department of the Automobile Club of Southern California is a report entitled, "An Appraisal of Freeways v. Surface Streets in the Los Angeles Metropolitan Area." This report describes practical test runs made by this organization on freeways and on surface streets. From data accumulated on these test runs it has been determined that the average cost of automobile operation on the freeways is 4.021 cents per mile whereas the average cost on surface streets is 8.215 cents per mile.

Page 16 of the report contains the following analysis applicable to the Hollywood Freeway:

North Hollywood to Civic Center	*Cost*	*Time—Min.*
A. Via Freeway		
10.0 miles freeway @ 4.021¢	40.2¢	12.38
2.0 miles streets @ 8.215¢	16.4¢	6.14
Total	56.6¢	18.52
B. Via Surface Streets		
13.0 miles @ 8.215¢	106.8¢	39.90
Saving one way	50¢	21.4
Saving round trip	$1.00	42.8
No. one way trips per day	101,000	
No. one-way trips pear year	36,865,000	
Saving one way	50¢	21.4
Saving per year	$18,432,500	

Considering that the total cost of the Hollywood Freeway was $55,000,000 then the computed savings of $18,432,000 per year would indicate that traffic use will pay for the total cost of the Hollywood Freeway in three years time.

In addition to the direct benefits that can be evaluated as money savings for motorists using the completed Hollywood Freeway, there are many indirect benefits of great value that should not be overlooked. The Hollywood Freeway has taken very large percentages of the traffic from existing overcrowded city streets, and the motorists now using these existing city streets are greatly benefited on that account. The freeways also provide motorists with safer driving conditions. Accidents, injuries and deaths are greatly reduced. These items, while of tremendous value, cannot be estimated in dollars and cents.

There are other methods by which the economic worth of a major traffic facility like the Hollywood Freeway may be evaluated. It would appear, however, that the Automobile Club of Southern California has taken a direct and practical approach in making its evaluation of this freeway and that their conclusions are fair and conservative. A large capital investment such as the Hollywood Freeway that pays itself off within three years and continues to pay large dividends throughout the years to come is certainly a project in which the people of California, who are cheerfully paying the costs through gasoline and other taxes and fees, can take justifiable pride.

There have been unavoidable delays in getting the Hollywood Free-

Looking northwesterly showing in foreground Ivor Street underpass with Cahuenga Boulevard eastbound on-ramp over it and with the Franklin Avenue off-ramp above. This constitutes a three-level interchange.

STATE CONSTRUCTION CONTRACTS—HOLLYWOOD FREEWAY

Limits and description	Awarded	Completed	Const. cost	Contractors
Benton Way, overcrossing	2- 4-46	9-16-47	$169,500	Byerts & Sons, Los Angeles
Diamond St. to Sunset Blvd., drainage	10-24-46	6- 7-47	197,800	Chas. T. Brown, San Fernando
Silver Lake Blvd., undercrossing	11-14-46	4-27-48	461,000	Guy F. Atkinson, Long Beach
Grand Ave., grade separation	12-19-46	2- 6-48	259,000	Oberg Bros., Inglewood
Barham to Vineland, 6-lane divided highway	5-28-47	2- 9-49	1,735,100	Peter Kiewit Sons Co., Arcadia
At Harbor Freeway, 4-level structure	6-24-47	8-17-49	1,183,700	Jas. I. Barnes Const. Co., Santa Monica
Alvarado St., undercrossing	10-20-47	10- 6-48	362,700	Guy F. Atkinson Co., Long Beach
Virgil, Hoover and Rosemont, grade separations	1-20-48	2- 3-49	607,300	Spencer Webb Co.
Figueroa St., grade separation	2-27-48	10-19-49	1,059,500	C. Bongiovanni, Los Angeles
Boston St.	4-22-48	7-19-48	16,900	McClain Const. Co., Hawthorne
Vendome St. and Coronado St., undercrossings	4-26-48	5- 9-49	351,000	Chas. MacClosky Co., San Francisco
Beaudry St. and Bonnie Brae St. grade separations	5-14-48	5-19-49	452,200	J. E. Haddock Ltd., Pasadena
Barham to Vineland, lighting	6-29-48	4-12-49	41,200	Tri Cities Elec. Serv., Los Angeles
Vermont Ave. and Melrose Ave., grade separations	9- 2-48	2-10-50	999,000	Spencer Webb Co.
Santa Monica Blvd. and Normandie Ave., grade separation	11-16-48	3-22-50	618,700	J. E. Haddock Ltd., Pasadena
Western Ave., overcrossing	12-15-48	6-15-50	708,300	Oberg Bros., Inglewood
Glendale Blvd. to Echo Park Ave., grade separations	1- 6-49	2- 1-50	497,600	J. E. Haddock Ltd., Pasadena
Heliotrope Dr., undercrossing	2-17-49	4-25-50	521,600	Chas. MacClosky Co., San Francisco
Civic Center, grading, and Broadway, overcrossing	1-18-49	1-19-51	1,038,300	Guy F. Atkinson Co., Long Beach
Virgil to Glendale, 8-lane divided highway	6- 9-49	2-13-51	1,438,000	N. M. Ball, Sons, Berkeley
Glendale to Grand, 8-lane and 6-lane divided highway	6-24-49	2-16-51	1,032,700	N. M. Ball, Sons, Berkeley
Hollycrest Dr. to Vineland, illuminated directional signs	10-31-49	11-25-49	4,300	Elect. & Machin. Serv. South Gate
Edgeware Rd., overcrossing	3- 1-49	12- 5-49	125,300	J. E. Haddock Ltd., Pasadena
Normandie Ave. to Alexander Ave., outer highway	4- 8-49	7-11-49	32,400	McClain Const. Co., Hawthorne
Boston St., extension	4-14-49	6-10-49	17,500	Dragline Rentals Co., Wilmington
Barham to Vineland, landscaping	11-19-48	8- 5-49	28,600	Henry C. Soto Corp., Los Angeles
Heliotrope-Santa Monica, inbound grade separation	12-13-49	4-30-51	528,100	Chas. MacClosky Co., San Francisco
Hill St., overcrossing	1-26-50	6-11-51	448,700	Webb & White, Los Angeles
Western to Virgil, 8-lane divided highway	5-11-50	10-15-51	1,470,600	Griffith Company, Los Angeles
Sunset Blvd., overcrossing	5-25-50	9-27-51	333,300	Lars Oberg, Los Angeles
Fountain Ave., overcrossing	5-25-50	7-16-51	327,400	Oberg Bros., Inglewood
Virgil to Grand, lighting and signs	6-20-50	5-16-51	149,200	Newbery Elect. Corp., Los Angeles
Hobart to Western, drainage	6-29-50	4- 3-53	136,600	J. E. Haddock Ltd., Pasadena
Wilton Pl., overcrossing	6-20-50	7-20-51	336,000	Peterson & Baker, Los Angeles
Van Ness, grade separations	11-27-50	12-18-51	341,600	J. E. Haddock Ltd., Pasadena
Western to Virgil, lighting and signs	12-13-50	9-27-51	62,200	Fischback & Moore
Beaudry to Grand, roadside planting	12-22-50	9-12-51	47,200	Jannoch Nurseries, Altadena
Virgil to Beaudry, roadside planting	1-11-51	12-27-51	53,200	Jannoch Nurseries, Altadena
Parkman to Grand, roadside planting	5-23-51	6-18-52	40,100	Jas. E. Boothe, Compton
Holly Dr., undercrossing	1-19-51	1- 3-52	300,100	Peterson & Baker, Los Angeles
Grand to Spring, 8-lane freeway and outer highway, overcrossing	1-26-51	1-24-52	679,200	Webb & White, Los Angeles
Belmont Ave., pedestrian overcrossing	9-19-50	3- 6-51	35,400	Byerts & Sons, Los Angeles
Hollywood Blvd., overcrossing	2-20-51	7-15-52	350,000	Fredericksen & Kasler, Sacramento
Hill St., relocation, Sunset-Temple	4- 2-51	2-11-52	208,000	Webb & White, Los Angeles
Cahuenga Blvd., undercrossing	3-30-51	5- 5-52	300,900	Oberg Bros., Inglewood
Cahuenga-Gower, freeway and 5 bridges	5-31-51	7-30-53	1,864,000	Winston Bros. Co., Monrovia
Bronson to Gower, 2 bridges and drainage	6-21-51	12-31-53	958,700	Peterson & Baker
Lighting and signs at Harbor Freeway	6-28-51	7- 9-52	120,500	Ets-Hokin & Galvan, Wilmington
Cahuenga-Gower, lighting and signs	7-27-51	8-14-53	40,200	C. D. Draucker Inc., Los Angeles
Hollywood-Western, 8-lane Freeway	12-28-51	6- 2-53	1,460,400	Webb & White, Los Angeles
Hollywood-Western, lighting and signs	1-16-52	4-23-53	62,200	Westates Elect. Const., Los Angeles
Franklin Ave. at Vine and Argyle Sts., lighting	2- 6-52	5-14-53	3,900	Ed Seymour, Long Beach
Mulholland-Cahuenga and Gower-Hollywood Blvd., 6-lane freeway and 5 bridges	2- 1-52	7-16-54	2,497,400	Bongiovanni Const. Co., Los Angeles
Mulholland-Cahuenga and Gower-Hollywood Blvd., lighting and signs	3-12-52	6-15-54	159,300	Elect. & Machin. Serv. Inc., South Gate
Virginia-Spring, roadside development	6-27-52	7-28-53	110,100	Henry C. Soto Corp., Los Angeles
Hollywood Blvd.-Santa Monica Blvd., roadside development	8-10-53	5- 4-54	77,300	Jannoch Nurseries, Altadena
Cahuenga to Gower, Planting	2- 3-54	11-19-54 Est.	49,400	Jannoch Nurseries, Altadena
Gower to Hollywood Blvd., planting	8- 3-54	2-15-55 Est.	20,000	Floyd Mathews Co., Pasadena
Total			$27,527,700	

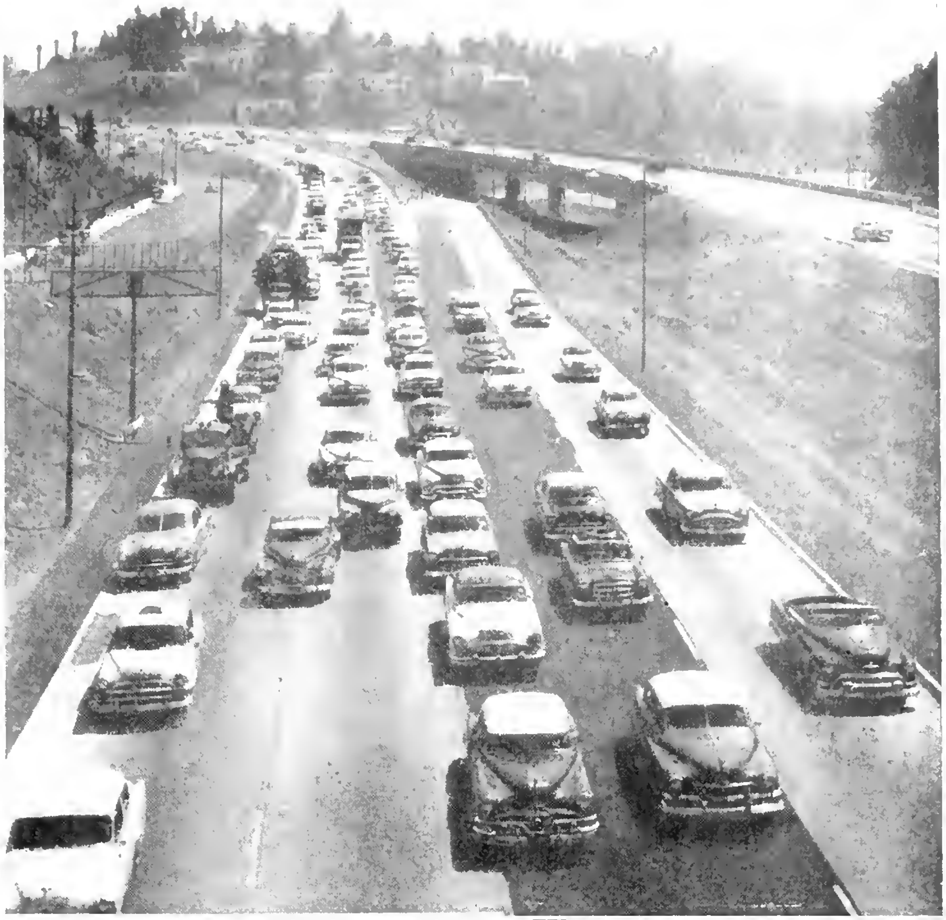
way completed. However, the time interval between the ribbon-cutting date when the main traffic lanes were opened to the public and the time of official completion on August 5, 1954, does merit explanation. During the course of this final contract the construction work between Hollywood Boulevard and Pilgrimage Bridge required that public traffic be threaded hither and thither through and around construction, sometimes in what appeared to be a very confusing manner. Actually there were 18 separate stages of detours that were necessary during the two years time that this complicated construction work was in progress. It was not until the main traffic lanes were made available to the traveling public throughout the limits of this contract that the contractor was then able to step in and complete all the work required along the sides of the main freeway on the traffic interchange ramps and frontage roads.

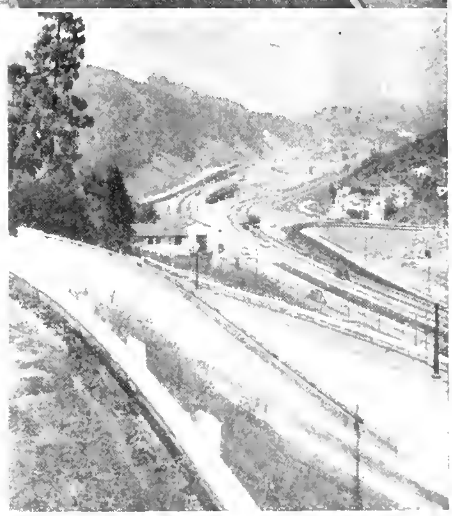
A final word of commendation to the long-suffering traveling public which has had to utilize the Hollywood Freeway during the construction period. The cooperation of these motorists and their patience and forbearance under very trying conditions represents the final and not the least important phase of the over-all cooperative effort required to make the Hollywood Freeway a reality.

AMERICAN ROAD BUILDERS' DIRECTORY

The new 1954 directory of Highway Officials and Engineers has been issued by American Road Builders' Association. It contains the following useful information: more than 1,500 names, titles and addresses of administrative engineers and officials in the 48 state highway departments and the District of Columbia; administrative personnel of the Bureau of Public Roads, including the heads of its division offices; engineers and administrative personnel of toll road authorities; officers and directors of ARBA, its seven organized divisions, and its Washington headquarters staff; a tabulation by states showing highway funds expended during 1953, as well as an estimate of expenditures for highway construction and maintenance during 1954; a tabulation of states having legislative authority to construct toll roads.

As in previous years, the directory is available at $1.00 per copy.





UPPER—Looking southerly along Hollywood Freeway from Pilgrimage Bridge showing Highland Avenue on-ramp undercrossing in center and Whitley Heights in background. LOWER—View looking northwesterly along Hollywood Freeway from Whitley Heights showing multiplicity of outer highways and interchange roadways necessary at this location.

HURRY IS DANGEROUS

Hurried driving is a great cause of accidents. The reason is that a sense of being in a hurry clouds a driver's judgment and often causes him to take chances.

Early axle grease was made by the natives of early day New Mexico, according to the National Automobile Club, by mixing tallow with tar obtained from the roasting of green pine branches.

LEFT TURNS MORE DANGEROUS

Turning left is one of the most dangerous maneuvers in the whole field of driving.

Last year's nation-wide statistics show 2,200 persons were killed in accidents involving an automobile which was making a left turn. This is more than were killed as a result of skids.

Ground Breaking

Governor Launches Two Major Freeway Projects

GOVERNOR GOODWIN J. KNIGHT emphasized the progress being made in California highway construction when he participated in ground-breaking ceremonies for two major freeway projects in the Los Angeles area in late September.

On Monday, September 20th, the Governor addressed a gathering marking the start of work on the new Sunset Boulevard overcrossing of the proposed 73-mile Sepulveda Freeway. The following Wednesday, September 22d, he broke ground in El Monte for construction of another four miles of the Ramona Freeway between Rosemead Boulevard and the San Gabriel River.

Groups of civic leaders, businessmen and residents of nearby communities attended both ceremonies.

Highways Necessity

Highways are no longer a luxury, but a necessity to move goods and people, the Governor told them. To construct and improve these highways the State is spending nearly $1,000,000 every working day out of gasoline and other highway user tax funds. They will be better, safer highways, he said. The Governor pointed out that comparable highways in the East are being built as toll roads.

Governor Knight described the need for and benefits of the projects which were getting under way, and the progress on related highway construction and financing. Also, he said, U. S. Highway 99 between Los Angeles and Sacramento and U. S. Highway 101 between Los Angeles and San Francisco were being converted to four or more lanes divided throughout.

Sunset-Sepulveda

The ceremony marking the start of construction on the Sunset-Sepulveda separation took place near the intersection of the two boulevards. Robert E. McClure of Santa Monica, member of the California Highway Commission, was master of ceremonies and introduced the Governor.

Ralph B. Bronson (center), business manager of the International Union of Operating Engineers, A.F.L., examines Governor Goodwin J. Knight's union membership card before the governor climbed aboard a bulldozer for groundbreaking ceremonies for on overhead crossing of Los Angeles' proposed Sepulveda Freeway. The card was in order. Looking on at right is Jack W. Baker, of Peterson and Baker, the contractors who will build the structure.

The project will consist of four bridges, with ramps and frontage roads. The main structure involved is the one which will carry Sunset Boulevard over both the proposed Sepulveda Freeway and existing Sepulveda Boulevard. Another structure will carry Ovada Place under the Sepulveda Freeway. The contract was awarded by the Department of Public Works September 14th to George W. Peterson and Jack W. Baker on their low bid of $722,657.

Governor Knight pointed out that portions of this project will be of immediate use on completion and will constitute necessary preliminary work for a project to provide as soon as possible a useable portion of the Sepulveda Freeway from Waterford Street to Casiano Road. Although funds for this work from Waterford Street to Casiano Road had not been budgeted at the time of the ceremony, the plans are nearly complete and right-of-way acquisition is well advanced.

Robert E. McClure, member of the California Highway Commission, left, and Mayor R. C. Miller of El Monte watch as Governor Knight manipulates the controls of a bulldozer used to break ground for a new section of the Ramona Freeway in Los Angeles County

Importance of Freeway

Early development of the Sepulveda Freeway is of importance to the west and south coastal sections of the Los Angeles metropolitan area as well as to afford traffic relief on existing highways and streets through the San Fernando Valley leading into and through central Los Angeles, the Governor stated.

He also noted that traffic from the north on US 99 and from the west on US 101 which does not desire to enter the central area of Los Angeles will be able to use the Sepulveda Freeway.

More than $6,000,000 has been expended to date for rights of way on the Sepulveda Freeway between the Long Beach Freeway and the San Fernando Reservoir, and additional funds are available for right-of-way purchase. The entire route, said Knight, has been adopted by the California Highway Commission. It extends from US 99 at the San Fernando Reservoir to a connection with US 101 in the vicinity of El Toro in Orange County.

El Monte Ground-breaking

Ground-breaking for the new section of the Ramona Freeway was preceded by a luncheon in El Monte Civic Auditorium sponsored by the El Monte Lions Club, at which Governor Knight also spoke.

On the route of the freeway, at the site of the old Gay's Lion Farm on Valley Boulevard just south of Peck Road, Governor Knight mounted a big bulldozer, which made a symbolical cut of earth with its massive blade. Music was provided by the El Monte High School Band.

At this gathering, the Governor said that time would be saved through the letting of a single contract for all phases of construction on the freeway through El Monte. Even so, he said, it would take more than a year and a half for completion.

The contract for the El Monte work was awarded by the Department of Public Works on September 13th to the Peter Kiewit Sons Co., on a low bid of $5,960,421. It is the largest single state highway contract ever awarded to date. Included is all of the grading, structures and paving to complete the four-mile, six-lane section of the Ramona Freeway from Rosemead Boulevard to the San Gabriel River.

A $3,813,436 contract awarded July 1st to the Griffith Company is in progress on a 3.3-mile section of six-lane freeway adjoining the newly started job on the east, from the San Gabriel River to West Covina.

Construction is nearing completion on the sections through the Ontario-Upland and Pomona-Claremont areas, and the Highway Commission has allocated $3,630,000 for construction of 4.2 miles through West Covina from the west city limits to Citrus Avenue. Bids on this work will be received in Los Angeles October 21st.

At Last

New Highway in Alpine And Mono Counties Opened

By A. L. TSCHANTZ-HAHN, District City and County Projects Engineer

Completion of 17½ miles of new highway which connects by a more direct route the county seats of Bridgeport in Mono County and Markleeville in Alpine County was celebrated by the boards of supervisors of the two counties with a dedication ceremony at the Mono-Alpine county line Sunday, September 12th, when the new road was opened formally to traffic.

Governor Knight was represented by Director of Public Works Frank B. Durkee, Chairman of the California Highway Commission.

Arranged by the boards of supervisors of the two counties, with Sheriff Orrin Brown of Alpine County as master of ceremonies, the dedication was in two parts, the first a ribbon-cutting, the second a barbecue at pine-shaded Bagley Flat in Markleeville.

Invited to snip a blue and gold ribbon stretched across the highway at the Alpine-Mono County line, Durkee called upon his wife, Wanda, to do the cutting, surrounded by state and county officials and their wives while some 200 persons watched.

The county line is at an elevation of 7,910 feet, slightly lower than the nearby summit of the highway on the shoulder of 8,985-foot Leviathan Peak.

In the brief ceremony, Sheriff Brown said the highway represented a gate opened in the fence between two good neighbors, and Hubert B. Burns, Chairman of the Alpine County Board of Supervisors, and Gene Crosby, Chairman of the Mono Board, shook hands across the ribbon and exchanged compliments. Durkee praised the two counties for their efforts and cooperation with the State toward completion of the highway.

Preceded by a historical resume of the highway presented by Grant Merrill of Woodfords, Alpine County, Durkee brought the greetings of Governor Knight to an estimated 600 persons at the barbecue.

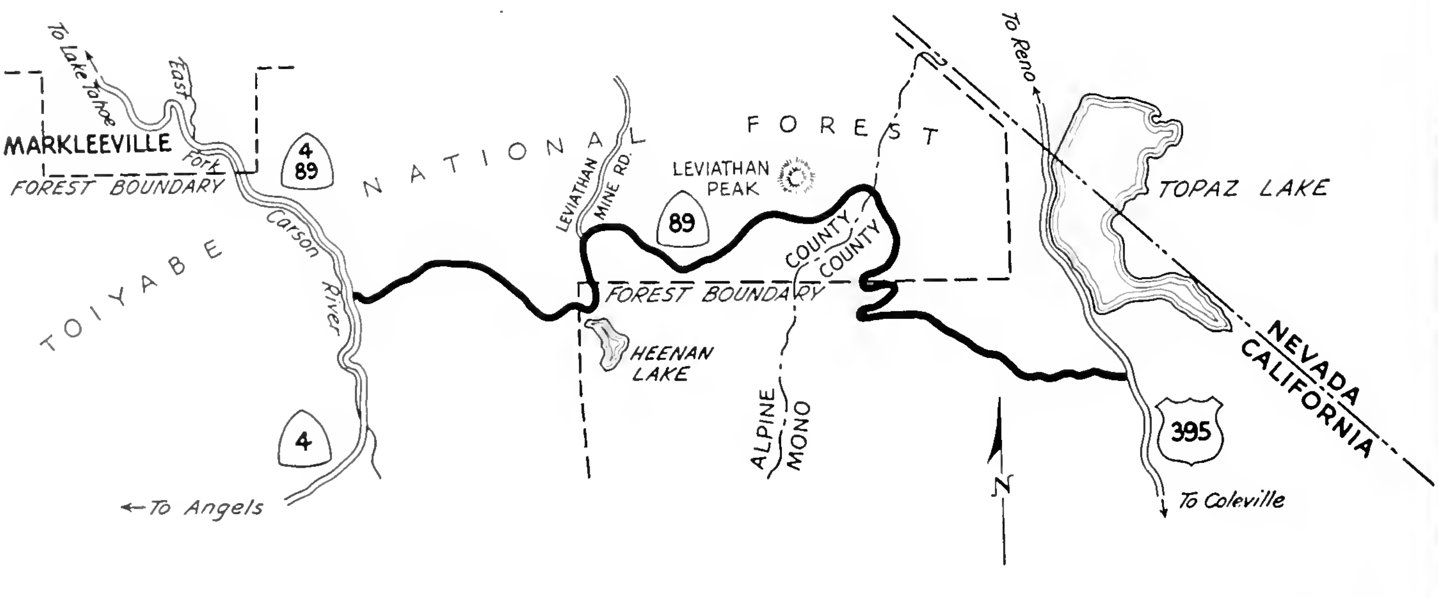
The new highway, built over tortuous mountain terrain, extends from US 395, north of Coleville in Mono County, to the Ebbetts Pass Highway, south of Markleeville in Alpine County. Locally known as the Markleeville-Coleville Highway, it has been designated a portion of State Sign Route 89.

New Route Much Shorter

Hitherto, the only feasible route between Bridgeport and Markleeville was via Minden, Nevada, 25 miles longer than the new route. In addition to providing an all-California road between the two county seats, the new highway will provide more direct access from Southern California to the recreational areas in the vicinity of Markleeville and Lake Tahoe.

It was pointed out by Durkee that linking of the county seats carries out a mandate of the Highway Act of 1909, which established the State Highway System and provided the first bond issue for highway construction.

That act contained a provision to the effect that county seats must be connected by highway routes. As far as Markleeville and Bridgeport were concerned, this connection existed only on paper, since it was obviously impossible with the limited funds available to construct a highway in the sparsely populated, mountainous area until more pressing state-wide needs had been met.



Counties Contribute Funds

Alpine County, 1950 population 241, and Mono County, population 2,115, acting jointly, sought to close the gap by use of federal aid secondary funds in a series of projects, in which technical assistance was given by the State Division of Highways. The counties also contributed funds of their own.

At an expenditure of approximately $394,000 over a period of five years, the counties completed surveys and grading to federal aid secondary standards over most of the route, and in 1952 the California Highway Commission adopted it as a state highway route. This action was followed by the budgeting of state highway funds for grading a remaining gap of 3½ miles and surfacing the entire 17½ miles of highway. A $509,000 contract for this project was let in early 1953, and the work was completed in July, 1954. In addition to the cost of construction, a total of $61,100 was expended for preliminary and construction engineering.

Mrs. Wanda Durkee snips ceremonial ribbon. LEFT TO RIGHT: Assemblyman Francis C. Lindsay, Loomis; Director of Public Works Frank B. Durkee, Mrs. Durkee, Mrs. Milton Harris, wife of District Highway Engineer Harris, Bishop.

Dedication scene. INSET LEFT: Senator Swift Berry, Placerville. INSET RIGHT: Supervisor H. B. Burns, Alpine County; Supervisor Gene Crosby, Mono County.

Of the approximate total of $965,000 expended on this new road, which figure includes preliminary and construction engineering costs, the distribution by agencies and funds is as follows:

Alpine County	
FAS funds	$159,100
CHAA funds	60,000
Chapter 20 funds	106,400
County funds	45,600
Subtotal	$371,100
Mono County	
FAS funds	$93,200
Subtotal	$93,200

State of California

FAS funds	$102,400
SH funds	398,300
Subtotal	$500,700
Grand Total	$965,000

As a start for one of the few completely new California highways built in recent years, Alpine and Mono Counties had about 5½ miles of dirt road in two separate locations. One road extended along Monitor Creek from Sign Route 4 (Ebbetts Pass Highway) south of Markleeville to the vicinity of Heenan Lake. On the opposite end, a Forest Service road ran its half mile up Slinkard Canyon from US 395.

Rugged Terrain

The 12-mile stretch in between was virgin country, accessible only on foot or horseback, in high terrain where a highway would have to skirt Leviathan Peak, which rises to a height of 8,985 feet. Although about half the 15 miles is in Alpine County, Mono County in 1947 contracted with a consulting engineer to make a survey of the whole contemplated route.

UPPER: New highway looking from just west of Alpine county line. LOWER: Looking east on new road.

. . . Continued on page 30

Portola Overhead

FAS-County Funds Finance Plumas Road System

By F. L. O'ROURKE, Road Commissioner

As thousands of people all over the Nation celebrated Labor Day, 1954, the people of Portola in Plumas County were realizing "the fruits of their labor" through the formal dedication of their 20-year dream, namely the Portola Overhead. At 10.30 a.m. on that day, the sorely needed overpass was opened to the use of the public.

Those who joined in the ribbon cutting ceremony as speakers were Assemblywoman Pauline Davis, Supervisor Clair Donnenwirth, and two representatives of the Division of Highways, H. B. LaForge, Engineer of Federal Secondary Roads from Sacramento, and J. W. Trask, District Engineer from Redding. Other county officials present were Supervisors J. C. Cloman (Chairman of the Board), E. J. Humphrey and J. F. Flanagan, and County Engineer Joe Watson.

The City of Portola was represented by Mayor Ira C. Baldwin and Councilmen Ray Ross, George Conant and Bernard Guzenske. The master of ceremonies, L. C. DeArmond, introduced the Portola High School Band, and midst the band playing and fanfare came the happiest moment of all when Miss Joan Alorza, this year's Plumas County Fair Queen, snipped the ceremonial ribbon, thus officially opening the project to traffic.

This project was first proposed in the early twenties when Portola was an unincorporated town. Businessmen tried to undertake this work under the Public Works Administration, but before all were in agreement with the location of the overpass, the Public Works Administration no longer existed. Again in 1935, this project was proposed but little progress was made at that time. In 1945, the county placed a $25,000 capital outlay in the budget for this project, and this amount was increased in 1949 to $50,000. It was through the tireless efforts of County Supervisor Donnenwirth and the present board of supervisors that in 1953, with the assistance of federal aid secondary highway funds plus state highway matching funds and help from Western Pacific Railroad, the project materialized at a cost of approximately $325,000.

The Portola Overhead consists of two steel girder bridges with concrete slab decks, one of 225 feet in length spanning the middle fork of the Feather River, and the other 196 feet long overpassing the tracks of the Western Pacific Railroad.

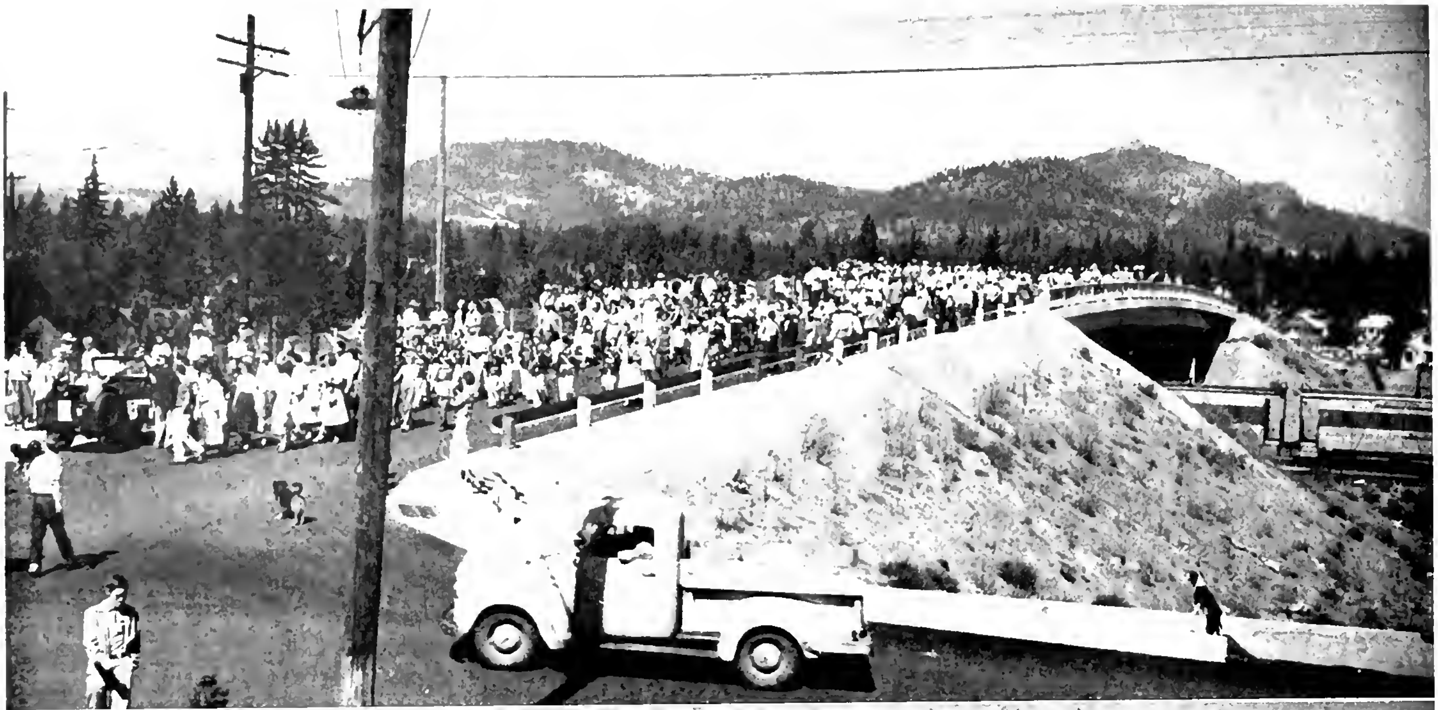
The completed project will expedite the flow of vehicular traffic, which sometimes numbers 5,000 per day, and people will no longer be compelled to use the inadequate bridge and train crossing which created a great human hazard, especially when ambulances, fire engines and police cars were halted sometimes for periods of 13 minutes at a time.

Not only was there cause for celebration in this little mountain city because of the completion of the Portola Overhead, but simultaneously the Plumas County Road Department completed the reconstruction of the Portola-McLear Road, County Road 114. This scenic county road was designed and constructed to modern standards for a distance of eight miles. It connects State Highway Route 21 (U. S. Sign Route 40 Alternate) with State Highway Route 83 (State Sign Route 89) and will serve the people of eastern Plumas County.

The Plumas County Board of Supervisors, as well as the writer, are very grateful for the cooperation shown by the Division of Highways, the Bureau of Public Roads and the Western Pacific Railroad.

Photos on following page

Old narrow bridge over the middle fork of the Feather River and grade crossing over Western Pacific tracks are replaced by new modern bridge and overhead. This long-needed improvement at Portola in Plumas County is accomplished under the federal-aid secondary highway program.



UPPER: First traffic over Portola overhead consists of Labor Day parade. LOWER: Assemblywoman Pauline Davis lends moral support to ribbon cutter Joan Alarza, queen of Plumas County Fair. Others in photo are (Left to Right): Ray Ross, Portola City Councilman; Harold B. LaForge, Engineer of Federal Secondary Roads with the Division of Highways at Sacramento, Ira C. Baldwin, Mayor of Portola; J. W. Trask, Division of Highways District Engineer at Redding; E. J. Humphrey, J. F. Flanagan and Clair Donnenwirth, members of Plumas County Board of Supervisors; J. C. Claman, Chairman of the Board; and F. L. O'Rourke, Plumas County Road Commissioner.

Road Contrasts

An Engineer Sees Highways in South American Countries

By GEORGE F. WINSLOW, Associate Highway Engineer

One has only to travel outside the confines of California to appreciate the splendid highways our State possesses. This truism again was impressed upon me by my latest trip beyond the borders of our commonwealth—this time a visit to South America.

My wife and I celebrated our twenty-fifth wedding anniversary by taking our two children on a trip to South America—down the West Coast; up the East Coast. We boarded the Norwegian freighter *M. S. Grenanger* at San Francisco, June 18th and made stops at Hueneme and San Pedro.

Leaving California, our first stop was Buenaventura, Colombia. This very active seaport is surrounded by dense jungles. While there we took a side trip through the jungles and Colombian Andes to the interior City of Cali. Orchids, banana trees, rubber plants, waterfalls, and other interesting sights were plentiful along the way. This narrow two-lane road winding through the mountains has some concrete and asphalt paving near the two cities and the remainder is waterbound gravel. Even though they have so much rain, the only poor subgrade effect that we noticed was in the concrete section. Our ship's cargo included a large supply of asphalt for this area. Truck traffic is large for this type of road.

We were quite intrigued with the way they drive in South America. While they are fast drivers and pass on blind curves, they have relatively few accidents. The slightest accident calls for a social meeting of the drivers, passengers, and all who are blocked by the vehicles which are left parked in the middle of the road. While the horn is an essential part of their equipment and used frequently, it is only as a warning and not as a claim for right of way or a protest for being blocked. Roadside shrines, for people who have been killed, are numerous along the roads with fresh flowers and burning candles. Another revelation was that when motor vehicles meet at night they turn their lights to dim or parking lights until they pass, both in the mountains and in the cities.

Escarpment section of divided express highway from Santos to Sao Paulo in Brazil

After leaving Buenaventura, our next stop was Guayaquil, Ecuador. This port, about 40 miles inland, is only accessible to large ships during high tide. Here, as well as elsewhere in South America, most of the streets are narrow and restricted to one-way traffic. Sidewalk merchants are numerous and busier than the adjacent stores.

On to Peru where we stopped at the seaports of Paite, Haucho, Callao, Cerro Azul, and Pisco. While Peru is situated along the west slope of the Andes Mountains, the Pan-American Highway has been completed from the Ecuadorian border to the Chilian border and laterals are planned to connect with Brazil and the Amazon River area.

We left the freighter at Tocopilla in northern Chile and traveled by taxi over 100 miles through the foothills of the Andes and the coastal plains to the airport of Antofagasta. The only vehicle encountered in the entire distance was the stage.

Due to the lack of good roads and the long distance between cities, airplane travel is well developed in South America. Even the school children, going to and from home during vacations, travel by plane. As we were flying from Antofagasta to Santiago on the Chilean Air Line, the Andes were so close to the coastline that we crossed spurs and saddles of the mountains where the wings of the plane just cleared the ground.

We had planned on crossing the Andes to Buenos Aires by train as we had heard interesting stories about the rail line but, due to shortage of time, it was necessary to fly across. We passed over the famous Statue "Christ of the Andes" on the Chilean-Argentina border. During their summer, an automobile road is open across the mountains at that location.

Buenos Aires, Argentina's main port is about 170 miles inland from the coast and is the point where we boarded the United States passenger ship *Del Sud* headed for the U. S. A. Buenos Aires has many beautiful parks and what is reported the widest street in the world below which is the largest underground parking for vehicles in the world. Florida Street, a narrow street of renown is Buenos Aires' Mecca for souvenir hunters. During shopping hours, no vehicles are permitted and the street is crowded from wall to wall with pedestrians.

Our next port was Santos, the main coffee shipping port of Brazil. From this port to the inland city of São Paulo is a multiple-lane express highway which would compare very favorably with any highway in the U. S. A. This 35-mile highway, started in 1940 and completed about six years later, cost about 12 million United States dollars. There are three distinct sections to the construction, the coastal plain, the abrupt rise of 2,400 feet of granitic escarpment called the "Serra," and the plateau. The coastal plain with its boggy areas required sand drains similar to those used on various highway projects in California. The plateau section involved bridging portions of the Rio Grande Reservoir. The "Serra" section with side slopes up to 60 percent, rains averaging 170 inches a year, and dense vegetation involved special engineering. It was found better to construct separate two-lane highways for the ascending and descending grades at different levels but somewhat parallel. It required about eight miles of switching back and forth to climb to the plateau section.

Structures for the highway consist of five curved tunnels, three large bridges, 20 viaducts and 47 large culverts. Speed limits are set at 47 miles per hour on the grade and 65 miles per hour on the leveler sections top and bottom. Busses are required to check in at both ends of the highway and have a minimum time limit of 52 minutes to make the trip. Prior to constructing the highway, and still in use, the railroad was the main connection between the cities. The railroad cars (passenger and freight) had to be raised and lowered over the face of the escarpment by cable.

Lone vehicle on 100 miles of road between Tocopilla and Antofagasta in Northern Chile

São Paulo is probably the fastest growing city in the world. Eight years ago it averaged 12,000 building permits a year and it now claims an average of one new building being completed every 40 minutes. São Paulo district produces more coffee than any other place in Brazil. Not far from São Paulo is the snake farm at Butantan where rattlers and other poisonous snakes are milked of their poison for use as serums.

The next port visited in Brazil was Rio de Janeiro, the playground of South America. After sightseeing in various parts of the city, including the Botanical Gardens, we took a winding road back to the city through dense vegetation and places where the road is cut out of the face of the cliffs to the top of Corcovado where is located the Statue of Christ the Redeemer. This statue, over 100 feet tall, is covered over the entire surface with small pieces of marble imported from Italy. The statue is illuminated at night and can be seen far out to sea as a lighted cross up in the air when the lights of the city have been blocked from view.

We left Rio and traveled several days on the ship to Willemstad on the Dutch island of Curacao off the coast of Venezuela. This port with its colorful buildings and pontoon bridge is considered a free port and a shopper's paradise. While they produce practically nothing of their own manufacture, they have merchandise from nearly every country in the world.

As all vacations must have an ending we knew ours was nearly over when we rode into the mouth of the Mississippi River and up to New Orleans. Then by train back to California and home to Sacramento.

Jungle road between Buenaventura and Cali in Colombia blocked by minor accident

GREATEST NUMBER OF INJURIES

A total of 2,140,000 injuries, the greatest number in recorded history, were suffered in traffic accidents in the United States during the year 1953.

DON'T DANGLE ARM

Don't dangle your arm from the driver's window, advises the National Automobile Club. False signals can cause confusion on our streets and highways, and confusion can easily end in collision.

CONSTRUCTION STARTS ON SOUTHERLY END OF HARBOR FREEWAY

LEFT TO RIGHT: Councilman John Gibson, Assistant State Highway Engineer Paul O. Harding, Jack Yount, vice president of Vinnell Constructors, Inc., the contractors; Assemblyman Vincent Thomas; State Highway Commissioner Robert E. McClure; Howard Crandall, president of the Wilmington Chamber of Commerce; County Surveyor Burton Chace, E. R. Beck, president of the Harbor City Chamber of Commerce; Dr. E. C. Spires, president of the San Pedro Chamber of Commerce; and Harbor Manager Bernard Caughlin.

Ground-breaking ceremonies at the southerly terminus of the Harbor Freeway near Battery Street in the San Pedro area, Los Angeles County, celebrated the start of construction work by the Vinnell Company. This $3,000,000 construction extending for 2.8 miles from Battery Street to Pacific Coast Highway was awarded by the Director of Public Works to the Vinnell Company on June 30, 1954.

An enthusiastic group of about 200 people gathered for the ceremony. They were undaunted by the fact that the contractor's huge bulldozers and power shovels were not available for breaking ground in the modern way so No. 2 long-handled shovels were passed around and the public officials present broke the ground the hard way as was customary some 50 years ago.

BAY BARRIER EXPERTS SEEK ANSWERS IN NORTH

The State Division of Water Resources is using ship locks on Puget Sound, near Seattle, as a guinea pig to find out how much salt water would get upstream from locks operated at salt-water barriers across San Francisco Bay. The study is being made as a part of the State's half million dollar investigation of feasibility of building a salt-water barrier in San Francisco Bay.

State Engineer A. D. Edmonston announced that 12 scientists and technicians from the University of Washington have been employed by the division to measure salt-water encroachment from ship locks between Puget Sound and Lake Washington in Seattle.

Engineers of the State Division of Water Resources currently engaged in the study of the practicability of a barrier or barriers across San Francisco Bay have determined that salt water will literally flow uphill through ship locks between bodies of fresh and salt water. What they don't

. . . Continued on page 43

AT LAST

Continued from page 24

First Survey by Kearns

The first survey, made by N. H. Kearns, Alpine County Road Commissioner, produced a line for the highway from the vicinity of Heenan Lake to the Alpine-Mono county line, a distance of 5½ miles. A contract for grading this section was let in July, 1949, and pushed through to completion in September of 1950, with the construction engineering work being handled by Alpine County. The contractor on this section was Arthur B. Siri, Inc.

The next step was to survey the seven miles from the end of the Forest Service road in Slinkard Canyon at the eastern end of the proposed highway near US 395 to the Alpine-Mono county line. This survey was conducted partly by the State Division of Highways under agreement with Mono County and partly by Alpine County's Road Commissioner Kearns. As on the Alpine County section, this work also involved difficulty of access, and finally a camp was set up near the center of the line to save a daily walking time of four hours.

Mono Portion

The Mono County portion of the highway was graded in two sections, one by Westbrook and Pope, approximately 3½ miles in length, westerly from the end of the Forest Service road and the other by C. V. Kenworthy, approximately four miles in length, connecting the Westbrook and Pope project with the completed work at the Alpine-Mono county line and including the reconstruction of the one-half-mile Forest Service road. In Alpine County the easterly 5.5-mile section was graded in 1950 under the supervision of the State Division of Highways. In addition to the contract work, Road Commissioner Kearns of Alpine County reconstructed approximately one mile of the existing road in the vicinity of Heenan Lake in Alpine County during 1950 and 1951, by day labor, with county forces.

This left an uncompleted section of 3½ miles, on which the Alpine County Road Department, under the direction of N. H. Kearns, made the preliminary location; the design and plans were completed by the State Division of Highways. Construction of this section was included in the overall grading and paving contract of the entire 17½ miles in Alpine and Mono Counties just finished by Claude C. Wood Co.-Macal Improvement Co., Inc. Work on this contract was started in May, 1953. Construction engineering was handled by state forces under the direction of Resident Engineer Ralph B. Weaver.

In Memoriam

CHARLES L. FLACK

Charles L. Flack, Associate Right of Way Agent of the State Division of Highways in District VIII, died on June 18, 1954, in San Bernardino, California, after a very brief period of illness and hospitalization.

Mr. Flock was born in Yazoo, Miss., on June 21, 1885. He went to San Bernardino with his father and mother when he was 12 years old. "Charlie," as he was affectionately known to all his friends throughout the State, went to work with the Atchison, Topeka and Santa Fe Railway Company in San Bernardino as a clerk in the Storekeeping Department, after which he was a shorthand reporter in the San Bernardino County Courthouse for 14 years. He was also in the real estate business for eight years preceding his entry into state service on January 26, 1931.

Charlie's entire 23½ years of service with the State was in the Right of Way Department, and he has been recognized by all as dean of all right-of-way negotiators.

He was a member of the Knights of Columbus, American Right of Way Association, a charter member of the C. S. E. A. and a past president of the local chapter, No. 7.

He is survived by his widow, Rose; two daughters, Lillian and Rosalind; and his son, Father John Flack.

In Memoriam

WENDELL H. AMMON

Wendell H. Ammon, Associate Highway Engineer in District VIII, Division of Highways, passed away June 25, 1954, following an illness of several months.

Wendell was born April 11, 1904. He attended high school in Los Angeles, California, and later majored in Civil Engineering at UCLA. He entered state service in June, 1930, as a draftsman in Headquarters Office of the Division of Highways, and four years later, transferred to District IX as Assistant Highway Engineer. In May, 1938, he transferred to District X, where he spent the greater part of his state service. In February, 1951, Wendell transferred to District VIII, where he served in the position of Assistant Design Engineer until his death. He had a well-rounded experience in highway engineering, having served in construction, laboratory, maintenance, planning, and design.

Mr. Ammon is survived by his widow, Dorothy; a son, William D. Ammon; two daughters, Mrs. Patricia Walker and Carol Ammon; his parents; his sister, Mrs. William P. Ryan; and seven grandchildren.

Wendell was a member of Morning Star Lodge F. & A. M. and the Scottish Rite of Stockton. Funeral services were held June 28th, with the Rev. Richard M. Mussen of the First Presbyterian Church officiating, assisted by San Bernardino Lodge 348, F. & A. M.

Fifty years ago in August, according to the National Automobile Club, the first citation for speeding was issued in the United States. The driver was fined $15 for going between 15 and 20 miles an hour and was later given a five-day sentence in the Newport, Rhode Island, County Jail.

California cities realize a higher total revenue from parking meters than municipalities in any other state. According to the National Automobile Club, the total fees collected in California exceed $4,500,000.

ANATOL EREMIN GIVES ADVICE TO HAWAII

Anatol Eremin, Associate Bridge Engineer, Division of Highways, was on loan for four months this year to the Department of Public Works, Territory of Hawaii, to assist with preparation of plans for two single bore highway tunnels through the Nuuanu Pali. Arrangements for this assignment were made at the request of Ben E. Nutter, Territorial Highway Engineer. Eremin arrived in Honolulu on March 24, 1954, and completed his assignment the end of July.

Eremin has been with the Bridge Department for about 26 years. He is a native of Russia and received the equivalent of a B.S. degree in Civil Engineering from The Institute of Ways of Communications, Petrograd, Russia, in 1917. In 1924 he received an M.S. degree in Civil Engineering from the University of California.

From 1917 to 1920, Eremin worked on construction of railroads, bridges

ANATOL EREMIN

and buildings in Russia; from 1920 to 1922 he was resident engineer for building construction in Shanghai, China; and from 1924 to 1928 he worked on design and construction of the Posey Tube, Oakland, California. Since 1928 he has been with the Bridge Department, Division of Highways.

WORK APPRECIATED

MR. GEORGE T. MCCOY
State Highway Engineer
Sacramento, California

DEAR MR. MCCOY: I want to thank you very sincerely for allowing Mr. Anatol Eremin, of your Bridge Department, to assist us in the design of the Nuuanu Pali Tunnel—a federal-aid highway project. He did a fine job and we are deeply appreciative.

I feel particularly grateful to the California Highway Department and to Mr. Eremin and yourself for providing us with that assistance.

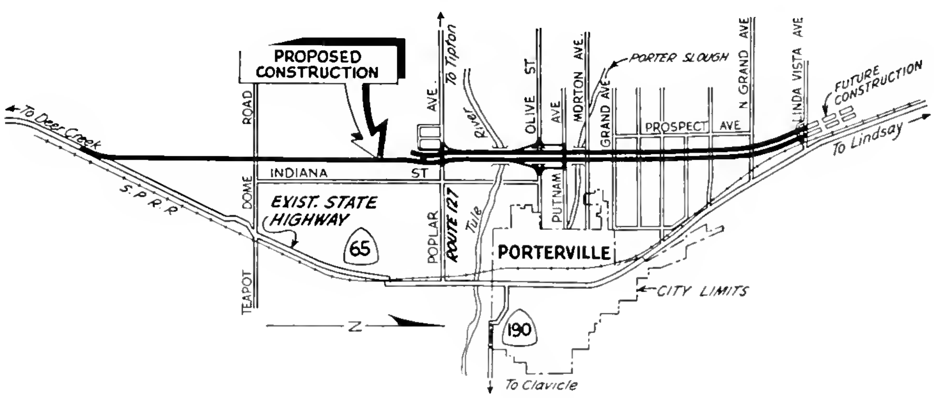
Very truly yours,
BEN E. NUTTER
Superintendent of Public Works
Territorial Highway Engineer

NEW HIGHWAY PROJECT IN TULARE COUNTY

On August 25th, Director of Public Works Frank B. Durkee awarded to Fredericksen & Kasler, Sacramento, a contract for $884,171 for structures and grading work on the 7½-mile relocation of State Sign Route 65 (Orange Belt Highway) in the vicinity of Porterville, Tulare County.

Construction on the new route which will carry through traffic to the west of Porterville will begin 1½ miles north of Deer Creek. The new highway will continue due north as far as Linda Vista Avenue.

The southerly half of the project, from the junction with the existing highway to Poplar Avenue (State Highway Route 127) will be graded initially for a modern two-lane highway, although sufficient right of way has been acquired for future construction of two additional lanes and a dividing strip.



From Poplar Avenue north to Linda Vista Avenue, structures will be built and grading done for a four-lane divided highway. The structures include twin bridges over both the Tule River and Porter Slough and a traffic interchange at Olive Street where the local east-west traffic will cross under the divided highway. The project also includes surfacing of frontage roads.

The State Highway Budget for 1954-55 contains an allocation of $1,110,000 for the grading and structures, which will require approximately a year to complete. A separate contract will be required for the paving of the highway.

Total cost of the new section, including the paving and the rights of way, is expected to approximate $2,750,000.

BAYSHORE FREEWAY BRIDGE IS JUDGED BEST OF ITS KIND

The Ninth and Tenth Street viaduct on the Bayshore Freeway in San Francisco has been judged by the American Institute of Steel Construction to be the most beautiful Class II steel bridge opened in 1954.

Each year the American Institute of Steel Construction sponsors a competition for the most beautiful steel bridge opened to traffic in the United States or Alaska during the previous year. Class II is for bridges costing over $500,000 and having no span over 400 feet. In making the award the institute said referring to the Bayshore Freeway structure:

"This bridge was acclaimed not only as a winner but as the most imaginative entry because it is an honest structural solution to a difficult and complex problem. There is great harmony in the structure even though both single and double columns are used in the supports. It exemplifies the strength, simplicity and integrity which can be accomplished merely by the use of steel alone."

The structure was designed by the California Division of Highways Bridge Department under Assistant State Highway Engineer F. W. Panhorst. Charles L. Harney, San Francisco, was the contractor and the steel was furnished and erected by Bethlehem Pacific Coast Steel Corporation.

This striking photograph shows the beautiful design of the Ninth and Tenth Street Viaduct on the Bayshore Freeway in San Francisco

Frank Escobedo Personnel Officer Of Public Works

After 2½ years absence during which he was Personnel Director for the City of Philadelphia, Frank J. Escobedo has returned to Sacramento and on September 1st accepted an appointment by Director of Public Works Frank B. Durkee as Departmental Personnel Officer of the Department of Public Works.

Escobedo is a graduate of University of California at Berkeley in Public Personnel Administration. He completed a year of graduate work at University of California's Bureau of Public Administration and had 10 years' personnel experience in California state service, including five years as a personnel officer. He had 3½ years' personnel experience in the U. S. Army, in which his last assignment was battalion personnel officer and adjutant. For the past 2½ years as personnel director for Philadelphia his basic job was to organize, plan, and put into operation a civil service and personnel management program for the city's 25,000 employees.

YES, WE DO DRIVE

Californians, on the average, drive about 1,000 more miles per person every year than the rest of the Country's citizens. According to the California State Automobile Association, the figures are: Californians, 4,396; United States average, 3,426.

FREEWAY DRIVING

Don't think that because you're driving on a freeway you can relax your attention. Driving is a full-time job no matter what kind of road you're on.

Hewes Award

Arnold Carver Recognized for Radio Communication

ARNOLD H. CARVER, Departmental Communications Supervisor for the Division of Highways, is the 1954 winner of the Dr. L. I. Hewes Award, according to an announcement by the Western Association of State Highway Officials.

Carver, who was nominated by State Highway Engineer Geo. T. McCoy, was presented with the award at the WASHO meeting at Sun Valley, Idaho, on September 18th, by James I. Ballard, president and publisher of *Western Construction* magazine.

The award, which is presented yearly for outstanding contribution to western highway development, also carries with it a cash prize of $500.

Carver is the second Californian to win the award. James T. McWilliam, Assistant Highway Engineer in the Division of Highways Planning Survey, was co-winner with H. W. Humphres of the State of Washington in 1952.

Photo shows Arnold H. Carver, Communications Engineer for the California Department of Highways, standing on left, receiving the Dr. L. I. Hewes award at the Western Association of State Highway Officials convention from James I. Ballard, President of Western Construction magazine, back to camera. Others in the picture, left to right, are: Hal Hale, Executive Secretary of the American Association of State Highway Engineers; R. H. Baldock, Oregon State Highway Engineer; C. O. Erwin, New Mexico State Highway Engineer and president-elect of WASHO; Carver and Ballard; WASHO President E. V. Miller, Idaho State Highway Engineer; and W. A. Willey, Secretary-Treasurer of WASHO and Engineer of Economics and Statistics, Arizona Highway Department. (Idaho Department of Highways Photo).

Award Honors Dr. Hewes

The award was established in 1951 to honor the memory and achievements of Dr. Hewes, the late Western Regional Chief of the U. S. Bureau of Public Roads.

Carver's nomination for the Hewes Award came as a result of the leading part he has played in developing a state-wide highway radio communication system which includes 140 fixed installations and 650 mobile units. This system has made radio coverage available on every mile of the 14,000 miles of state highway in California which covers a wide variety of terrain and climatic condtions.

The system, which is one of the first to be developed in this Country, is being copied widely by other organizations and agencies.

Carver also played an important part in adapting two-way FM radio to Maintenance Department operations in the field.

As an additional service, road conditions which might affect traffic during storms or other unsettled conditions can be reported from any part of the State without delay and information concerning them passed on to the traveling public. During the winter months a daily road condition report compiled by the radio section is made available to newspapers, wire services, radio and television stations, transportation companies, automobile clubs, and other agencies concerned with giving out information to the motoring public.

Carver Prime Mover

Carver was assigned to the highway communications project in 1946 when the use of radio in connection with highway activities was first proposed, and he has been the prime mover in the design, construction, operation and maintenance of the system since that time.

For the past three years he has been Chairman of WASHO's Committee on Radio and a member of the Radio Committee of the national organization, the American Association of State Highway Officials.

Carver was born in Boston, Massachusetts, and received his engineering education at Los Angeles City College. He came to work for the Division of Highways in 1938.

During World War II he served overseas as a captain in the 51st Engineer Combat Battalion, returning to state service in 1945.

Carver, who lives at 2580 Romany Road in Sacramento, is married and has one son.

THE SAFE SIDE AND SUICIDE

Many a life would be saved, and many a motorist would avoid the inconvenience and expense of a costly accident, if all who drive cars would make it an inviolable rule to use the car door on the side away from traffic.

San Fernando Pass

Story of Historic Gateway To the San Joaquin Valley

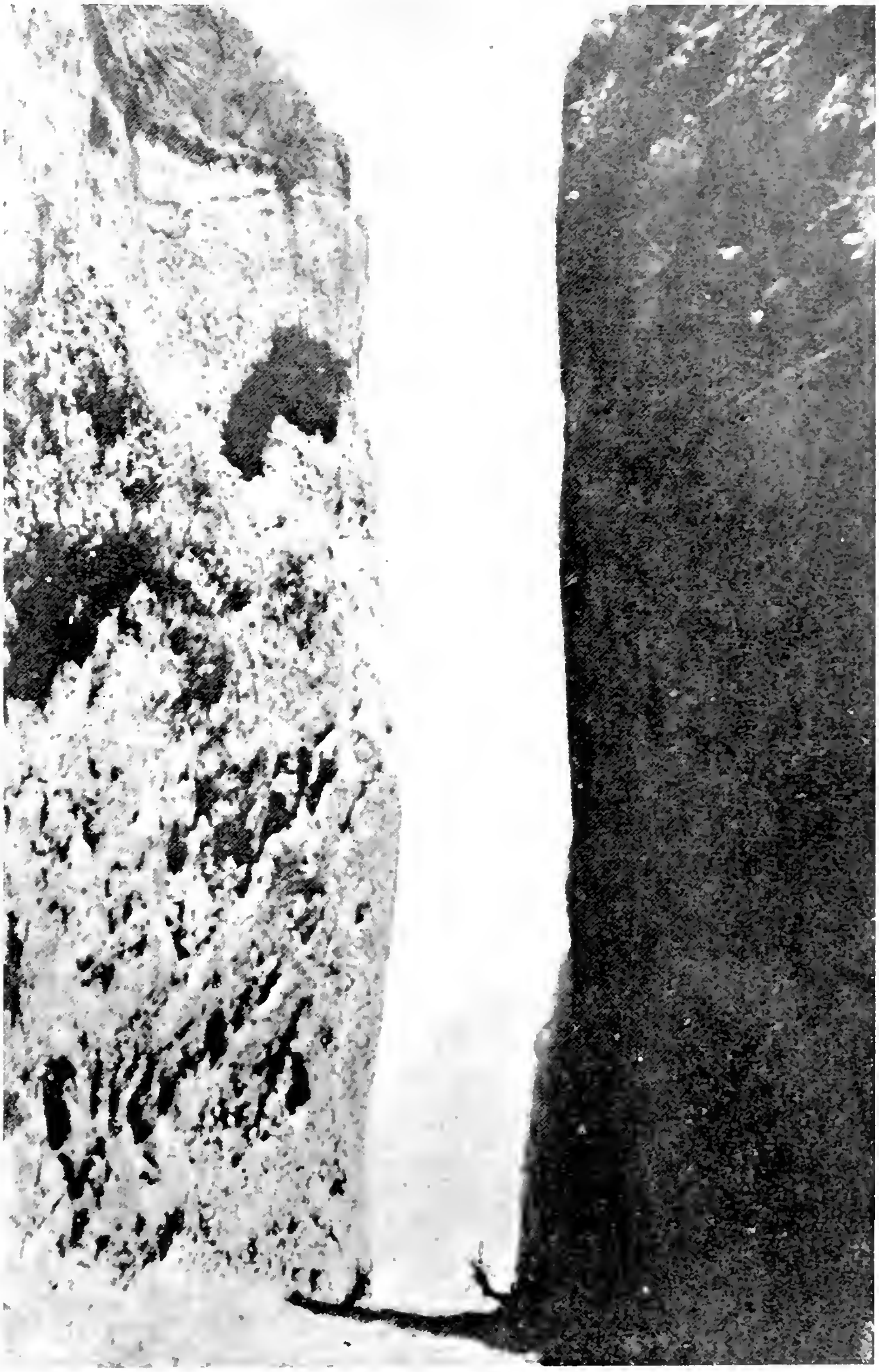
By ALICE FISHER SIMPSON

Of all California's mountain passes, perhaps none has played a more dominant part in the State's development than has the old, abandoned pass in the Santa Susana Mountains, a few miles north of San Fernando—within a stone's throw of the heavily traveled highway, US 6.

Once known as the Cuesta Viejo (the Old Grade), the historic pass has been called by various names: San Fernando Pass, Fremont Pass and the Old Newhall Grade. Its recorded history began in the year 1769, when Don Gaspar de Portola and his expedition, making their way up the coast in search of the Bay of Monterey, traversed the great plain that is now Los Angeles. By way of what is now Sepulveda Canyon, they passed over the hills into a great thirsty valley dotted with live oaks, and hemmed in by bleak mountains. From the friendly natives Portola learned that the only pass over the almost formidable barrier was an ancient Indian trail, where for centuries the bare feet of the aborigines had clung to holes gouged out of the rock in order to clamber over the steep ridge. Getting the overladen mules over the almost perpendicular rocky slope was a grueling, dangerous task; but with the help of the natives it was accomplished.

Twelve years later, with the founding of the Pueblo of Los Angeles by Felipe de Neve, Portola's route became the main highway for northbound travel through the Los Angeles region, and was known as El Camino Viejo (the Old Los Angeles Trail). The steep pass over which the expedition had made its way north was referred to as the Cuesta Viejo (the Old Grade), on the Camino Viejo.

Come September, 1797, the great sprawling valley lying at the foot of the Santa Susana Mountains became the site of the seventeenth Franciscan Station—Mission San Fernando Rey de Espana, named for the canonized King of Castile, Saint Ferdinand III. Found-



The famous Beale Cut on the San Fernando-Fremont Pass road—still in use as late as 1910 ing of the new mission called for an extension of El Camino Viejo, and by 1800 the route led from San Pedro to Mission San Fernando, through the well-nigh formidable pass over San Fernando Mountain in the Santa Susana Range, and into the valley of the Santa Clara River; thence over the Tejon Creek Pass, through the San Joaquin Valley to San Antonio (now East Oakland).

By way of El Camino Viejo and over the treacherous Cuesta Viejo, to the new Spanish settlements in the north, rumbled creaking ox-drawn carretas from the little Pueblo of Los Angeles. Over the same dangerous pass—the only means of reaching the Tejon Pass and the lush grazing lands of the Tulare Valley beyond – vaqueros drove the vast herds of lean, sharp-horned mission cattle. Bellowing fiercely as they stampeded their way over the abrupt slope of the steep, narrow grade, many of the animals were frequently crowded over the precipice, into the deep canyon below.

With the 1840's, California's languid pastoral era was slowly drawing to a close. History was on the march! Over the old Cuesta, in 1842, rode the excited Californian, Don Francisco Lopez, carrying from Placerita Canyon the first important gold discovery in California. Some of the nuggets from those first mines were taken over the old pass and sent to the United States Mint at Philadelphia.

With the accession of Don Pio Pico as Governor of Alta California, a grim crisis loomed: The United States and Mexico were at war! On July 7, 1846, Commodore John Drake Sloat raised the Stars and Stripes over the Custom House at Monterey. With 1847, Fremont and his California Battalion were marching on Los Angeles!

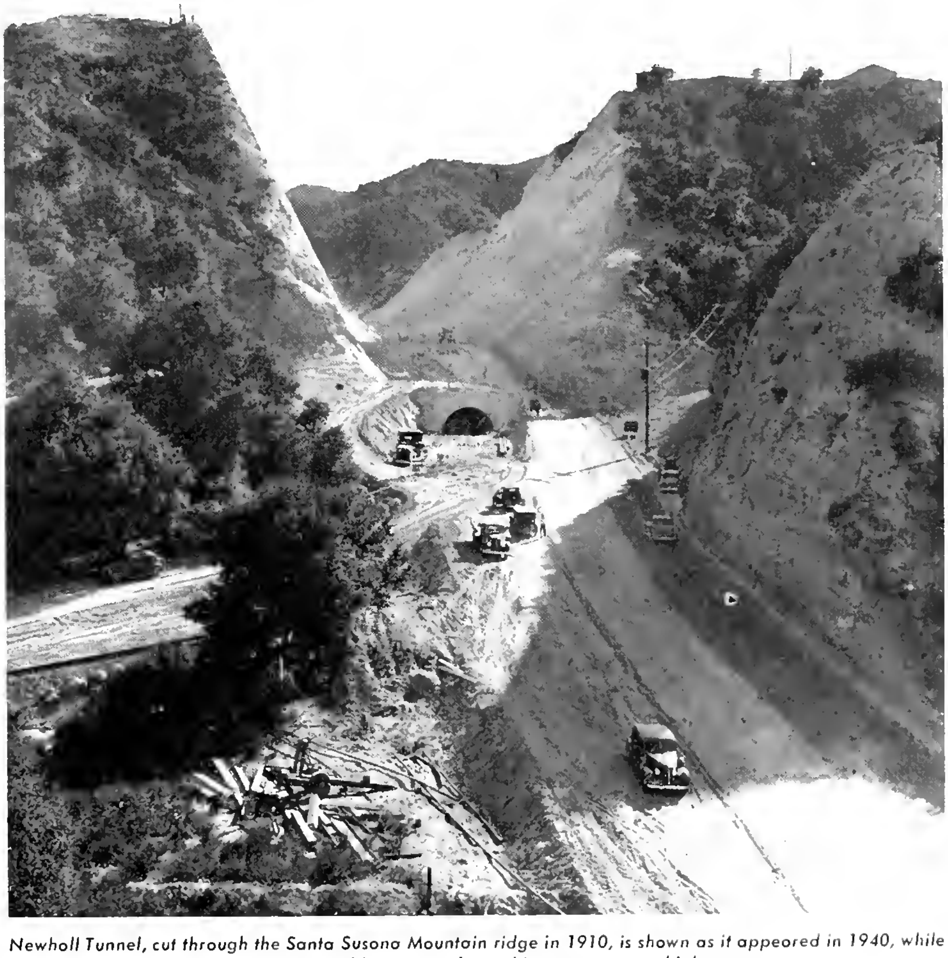
As the southern pueblo and the San Fernando Valley were destined to become the focal points in the conflict with Mexico, Fremont approached the Cuesta Viejo with the expectation of finding the enemy there in force. But the Californians had fallen back before his advance and the pass was undisputed. That the Cuesta Viejo was already known as the San Fernando Pass is borne out in Fremont's own description of a visit to the Mission of San Fernando. "It is," he stated, "at the foot of a pass of its own name."

Over the years, the exact location in the rugged hill country, where the intrepid Pathfinder and his divided troops actually broke their way over the brush-covered ridge of hills, has always remained more or less a matter of conjecture. His advance on the Mission of San Fernando, however, and his junction with Stockton in the San Fernando Valley, which ultimately led to the signing of the Treaty of Capitulation at the old Cahuenga adobe, is of sufficient historical significance to have inspired the name—Fremont Pass. (A marker bearing the latter name was erected by the San Fernando Ebell Club on May 26, 1916.)

Undoubtedly, the name Fremont Pass, as well as the name San Fernando Pass, was applied to the Cuesta Viejo by the thousands of emigrants who made up the wagon trains that were to converge on California following gold discovery on the American River in 1848.

From the Pueblo of Los Angeles north, all pioneer traffic passed over the main southern emigrant route, which lay across the Mojave Desert and over the Tejon Creek Pass to the Tulares. On the entire trip the greatest obstacle was the San Fernando or Fremont Pass; for while the existing trail over the precipitous grade was rather broad, it was so exceedingly steep that many a pioneer, contemplating the perils of the abrupt descent, was forced to lower his wagons over the mountain with a windlass or other contrivance.

By 1854, with the establishment of Fort Tejon in the Canada de las Uvas (Grapevine Canyon), about 15 miles southwest of the Tejon Indian Reservation, Los Angeles began to feel the urgent need of better communication with the outside world. Accordingly,



Newhall Tunnel, cut through the Santa Susana Mountain ridge in 1910, is shown as it appeared in 1940, while in the process of being transformed into an open cut highway in the summer of that year, the supervisors of the County of Los Angeles voted to spend $1,000 to open a wagon road over the mountains between the San Fernando Mission and the San Francisco Rancho. The most prosperous citizens of the pueblo, most of whom were carrying on various business enterprises from small adobe stores, were solicited for the remainder of the funds, and about $2,900 was subscribed.

A new and shorter canyon on San Fernando Mountain was selected for the new road, a little to the southwest of the original Cuesta Viejo, where the grade was lower. As the job ahead promised to be a tough one, it called for a tough foreman; so Gabe Allen—a rough, seasoned frontiersman and former Indian fighter from Chihuahua, Mexico, was hired to direct a road-building gang of 20 men.

In an endeavor to lower the grade, a rather shallow cut was made in the solid rock at the top of the mountain, and a roadway was built down the steep slopes of the mountainside. Long before completion of the project funds were exhausted, and it became necessary for the citizens of Los Angeles County to contribute the balance — a responsibility which they readily accepted, since everyone realized that the new road was a boon to the entire county.

By January of 1855, notwithstanding several washouts during the winter season, the New San Fernando Pass Road was finished. The grand celebration came on July 4th in Los Angeles. On July 3d, the military band from Fort Tejon—dragoons resplendent in their colorful uniforms—presented a romantic picture as they rode up the pass and through the new cut in the rock at the summit. Although a considerable improvement over the Cuesta Viejo, it was still a tough climb and a veritable scramble for the sweating, panting cavalry horses.

Teamsters, too, often had a bad time of it, hauling heavily laden wagons to the Sebastian Indian Reservation and Fort Tejon. The greatest stumbling block was an almost perpendicular ledge of rock about four feet down, where Phineas Banning's stage went over the grade and Bishop Kip's empty wagon took a similar plunge. At another time, Jacob Kuhrt was forced to use four yokes of cattle and a windlass to bring his team over the pass.

With the year 1857, through the narrow cut in the rocky summit, emerged one of the weirdest caravans ever to have been seen in California, when Lieutenant Edward Fitzgerald Beale led a United State Government camel train from San Antonio, Texas, to Fort Tejon, California, by order of Jefferson Davis, Secretary of War. It was a unique experiment on the part of the government to prove whether or not camels could be successfully used in transporting freight and supplies to the West and also in the construction of a wagon road across the southwestern desert to the Pacific.

In the long trek westward, crossing the Rocky Mountains had been difficult enough for small-hoofed beasts, geared for the heavy sand of the desert; but never had the clumsy, lumbering camels encountered anything quite as bad as the steep, rocky Pass of San Fernando. Gazing in profound wonderment, bewildered Indians stood spellbound as the huge awkward animals—their ugly necks outstretched—cautiously picked their way up the steep south slope of the pass, straining every nerve and muscle to scramble up the perpendicular rocky ledge. Once through the cut, the panting beasts paused for a moment, chewing their cud the while, and gazing dolefully at the steep, twisting slope before them, over which they would virtually have to slide their way down—heavy packs and all.

By 1860, Los Angeles businessmen were becoming exasperated by the endless struggle to move freight and supplies into the San Joaquin Valley. Shipping between the two points was at an all-time high; but between the market and the consumer stood that stubborn barrier of the Santa Susana Mountains—the San Fernando-Fremont Pass, practically useless during the rainy season, and so jammed with traffic at other times as to be virtually impassable for heavy teaming. Long trains of United States Government wagons from Fort Tejon were crowding the steep, narrow grade on their way over the Santa Susana Mountains for repairs. Wagon trains from Salt Lake and Fort Mojave were also cluttering the pass, waiting their turn to get through the narrow cut at the summit. In June of 1860, a bonanza gold strike at the Big Blue Mine (in the Sierra Nevada, on the North Fork of the Kern River) brought still more travel and confusion, along with the ever-increasing number of livestock that were being moved over the pass to the great plains of the southern Tulare Valley.

To add to the already complicated traffic situation, came the startling announcement that a telegraph line was to be built through the great empty stretches of the Tulare Valley, from Visalia south to Fort Tejon, thence from the fort over the mountains to Los Angeles. Plans called for huge loads of heavy, square redwood poles to be shipped from Northern California, by boat to San Pedro. From that port, Major Phineas Banning was engaged to transport the poles to the various points along the line. Fifty teams were made ready for the Herculean task and soon long lines of sweating horses tugged and strained to haul the heavy poles through the high cut in the San Fernando Mountain.

Throughout the years many changes had been proposed and some money had been appropriated for overcoming the serious traffic hazard; but little had actually been accomplished. With establishment of the Butterfield Overland Mail service between St. Louis, Missouri, and San Francisco, California, in 1858, the San Fernando Pass presented an almost impassable barrier for loaded passenger stages.

Cognizant of the serious impediment to overland travel, the County of Los Angeles, in June of 1858, appropriated money for improving the pass, both for widening of the road and deepening of the cut through the summit. By August, the Butterfield firm began running stages three times a week from San Francisco; but there were still times when frightened passengers preferred to get out and walk over the pass rather than risk being hurled over the grade. Meanwhile Los Angeles County continued the struggle to alleviate the traffic nuisance, spending considerable money in an attempt to build a tunnel through San Fernando Mountain; but like all the

Uncle Sam's Camel Train—one of the strongest caravans ever to travel the San Fernando Pass

other plans, this one too came to naught.

Then came the heavy winter of 1861-62, when California was lashed by some of the worst storms in her recorded history. Rampaging flood-waters poured down the steep slopes of San Fernando Mountain, completely washing away the road—thus severing all connections between Los Angeles and the San Joaquin Valley, with exception of the old trail over the precipitous Cuesta Viejo. The California Legislature promptly intervened, granting a franchise for a toll road across the pass to three Los Angeles citizens, one of whom was the former general of the California forces, Don Andres Pico—now a loyal American citizen. But once again nothing was done; and in 1862, the franchise, which called for cutting the pass down a distance of 50 feet, was turned over to Edward Fitzgerald Beale of camel fame, owner of the extensive Rancho El Tejon, whom President Lincoln appointed Surveyor-General of California and Nevada in 1861. Beale was an experienced hand in surveying routes, exploring mountain passes and building roads over their summits. He had previously been appointed by Secretary of War John B. Floyd, to supervise the construction of a military road from Fort Defiance, New Mexico, to San Diego, California, and now mustered all his engineering skill for an attack on the stubborn sandstone walls of San Fernando Pass. The former Surveyor-General and his men accomplished a most remarkable feat of pioneer engineering. With little more than pick and shovel and dogged determination, the narrow defile in the solid rock at the summit of San Fernando Mountain had been widened to approximately 15 feet and lengthened to a depth of from 50 to 60 feet—thus providing the growing southland with a reasonably safe, but still steep outlet with the north.

The new road through Beale's Cut, coupled with the new discoveries and developments which were to take place north of and around the San Fernando Valley, had a direct and profound bearing upon the phenomenal growth of the sleepy little Pueblo of Los Angeles. With discovery, in the late 1860's, of the famous Cerro Gordo Mines of Inyo County—rich in silver, lead and zinc, long lines of 10- and 12-horse teams pulled the heavy freighters back and forth between the Inyo mines and Los Angeles, with all traffic passing through Beale's Cut.

The development of the oil industry, which had its inception in February of 1865, with oil discovery in Pico Canyon, was another major factor responsible for the growth of Los Angeles, and likewise for the redevel-

... Continued on page 64

On-Job Training

Division of Highways Expands Courses on State-wide Basis

By A. C. DILDINE, Senior Equipment Engineer

The on-job training program of the Equipment Department, as described in the May-June, 1953, issue of *California Highways and Public Works*, has been in effect since August, 1953, when the first classes were started for the mechanics at Headquarters Shop, Sacramento. The program is presently in full operation, providing training on a state-wide basis for as many employees of the Equipment and Maintenance Departments as practical. Cooperative response is being received in every location covered.

The present training course is concerned with lubrication. It is intended to extend the subjects offered to include simplified courses in mechanics, shop methods, equipment operation and care, and any other subjects deemed advisable.

The need for on-job training resulted from the expanded highway development program since the end of World War II. This expansion has reflected directly on the Equipment Department in the increase of highway maintenance equipment owned and administered. The expansion is graphically indicated in the accompanying Statistical Data Chart on a percentage of increase basis. It is noted that there has been a 70 percent increase, since 1946, in the number of units owned, while there is only a 55 percent increase in the number of employees for this same period. In addition, the equipment has increased in complexity, as the use of complicated and highly specialized equipment has been found advantageous for practical and economical reasons.

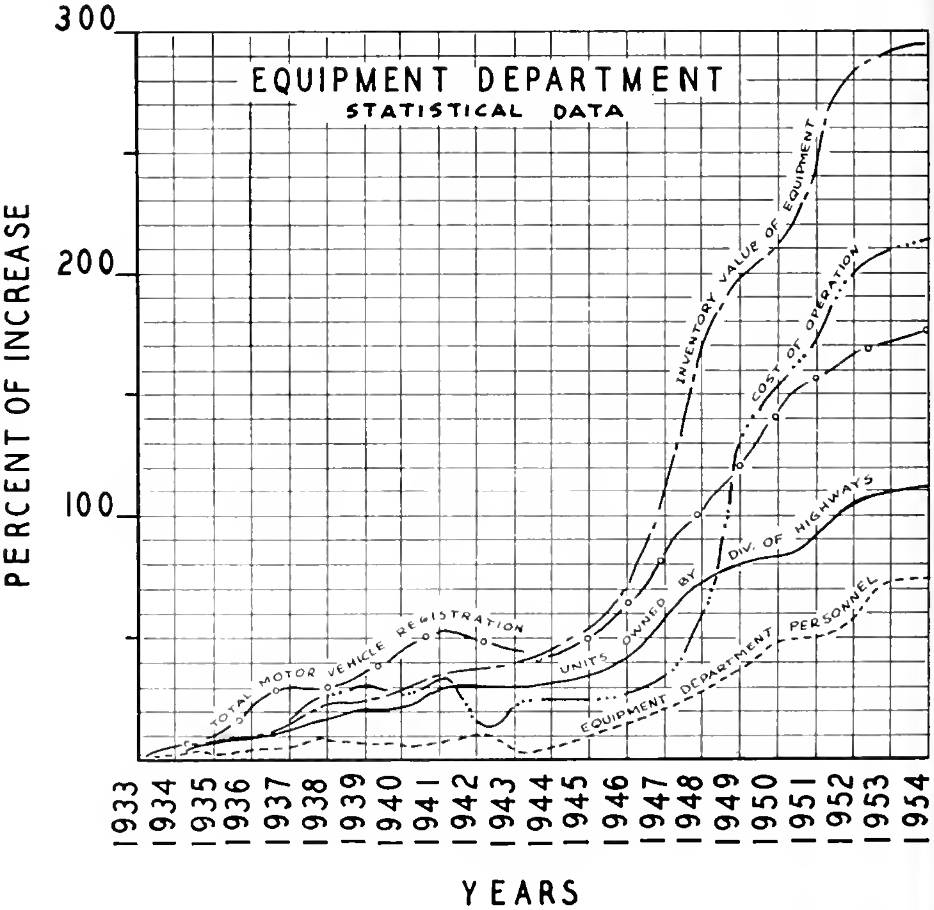
In order to keep pace with the increasing needs of proper servicing and preventive maintenance on this modern, complex equipment and hoping to decrease the need for repairs, the Equipment Department established the "On-Job Training Program" to take the instruction to the men. A classroom trailer was designed and procured which seats 18 employees at one time. The trailer is equipped with many modern audio-visual training aids which include a slide projector, motion picture projector, a tape recording device, and other aids in the way of charts and graphs and various illustrations. The trailer classroom has an air conditioning system, and its own self-contained power unit. This enables the holding of classes in all types of weather and in remote locations where power usage is critical. The classroom chairs are comfortable and conducive to proper attention to the discussions.

To date, two courses of instruction have been prepared. One is a five-unit course requiring a total of 16 hours of classroom instruction. The course is in lubrication and includes friction type bearings, automotive engine lubrication and lubricating grease and gear lubricants. The second course also covers lubrication but is condensed and requires only eight hours for presentation to the maintenance personnel on the assumption that they are not so concerned with the theories behind lubrication.

Classes were started in August of 1953 and to date, 1,122 employees have attended. Instruction has been given at Headquarters Shop in Sacramento and in Districts V, VII, VIII, IX, XI and parts of III and VI. The classroom trailer is now in District I.

State-wide Program

It is the intention to continue this program on a state-wide basis, bring-



ing the trailer to each district and establishing the classes in various maintenance stations and Equipment Department shops, where employee-gatherings may be easily arranged. We estimate that there are some 1,800 employees who will benefit by attending the courses.

On the basis of the districts already covered, it is estimated that a year will be required for the classroom trailer to make a circuit of the State. When one circuit is completed, it will be followed immediately by another, with a different subject of mutual interest and advantage to all Equipment and Maintenance Department employees. To date, the classroom trailer has traveled a total of 1,743 miles for instruction purposes.

Examinations have been given to those men who have completed the short course in lubrication. The subject matter is being absorbed in a very satisfactory manner as the majority of the men are obtaining grades of 70 percent or better.

Interior view classroom trailer. Facing front, Hilton F. Lusk instructing class of mechanics from Headquarters Shop.

Increased Efficiency

It is anticipated that the results of this on-job training will be reflected in a reduction of repair costs and in an increased efficiency and output on the part of the operating forces because of better understanding of equipment capacities and preventive maintenance. The loss in time due to equipment failures as the result of defective lubrication should be materially decreased. The Equipment Department maintains a constant check on repair costs to each individual unit by districts. The repair costs for all Division of Highways' motor vehicles and construction equipment in the 1952-53 Fiscal Year amounted to $3,123,654.53. The possibilities of making a substantial saving as a direct result of the investment in a trailer classroom and time required by the employees to attend classes are well worth the effort. The Maintenance Department, which is the principal user of the equipment, should experience a monetary benefit in a reduction of "down time" and an increase in output of equipment due to a better knowledge of each unit and its working requirements.

Class receiving outdoor instruction from Lusk, kneeling in foreground

CALIFORNIA HIGHWAY CONFERENCE

Proceedings of the 1954 California Street and Highway Conference are on sale by the University of California Press, Berkeley 4, Calif. Price: $2. The California Conference is presented annually by the Institute of Transportation and Traffic Engineering, of the university. It draws road men from all levels of government and the industry.

Calling Paul Bunyan

Clearing Del Norte Freeway Is Job for Legendary Logger

By B. D. VAN ZANDT, Resident Engineer

MANY TIMES during the past six months the McCammon-Wunderlich Company has wished that the legendary Paul Bunyan and his great Blue Ox, Babe, could be put on the pay roll to help with the monumental task of clearing 72 acres of right of way, much of it through dense virgin and second-growth redwood forest. This king-sized logging job was part of the contract awarded in April of this year for clearing and grading a 5½-mile portion of US 101 between US 199 and the Smith River Bridge in Del Norte County. Also included in the contract was approximately one-half mile of construction along US 199 at the south end of the project and the construction of two reinforced concrete cattlepasses on US 101 north of the Town of Smith River.

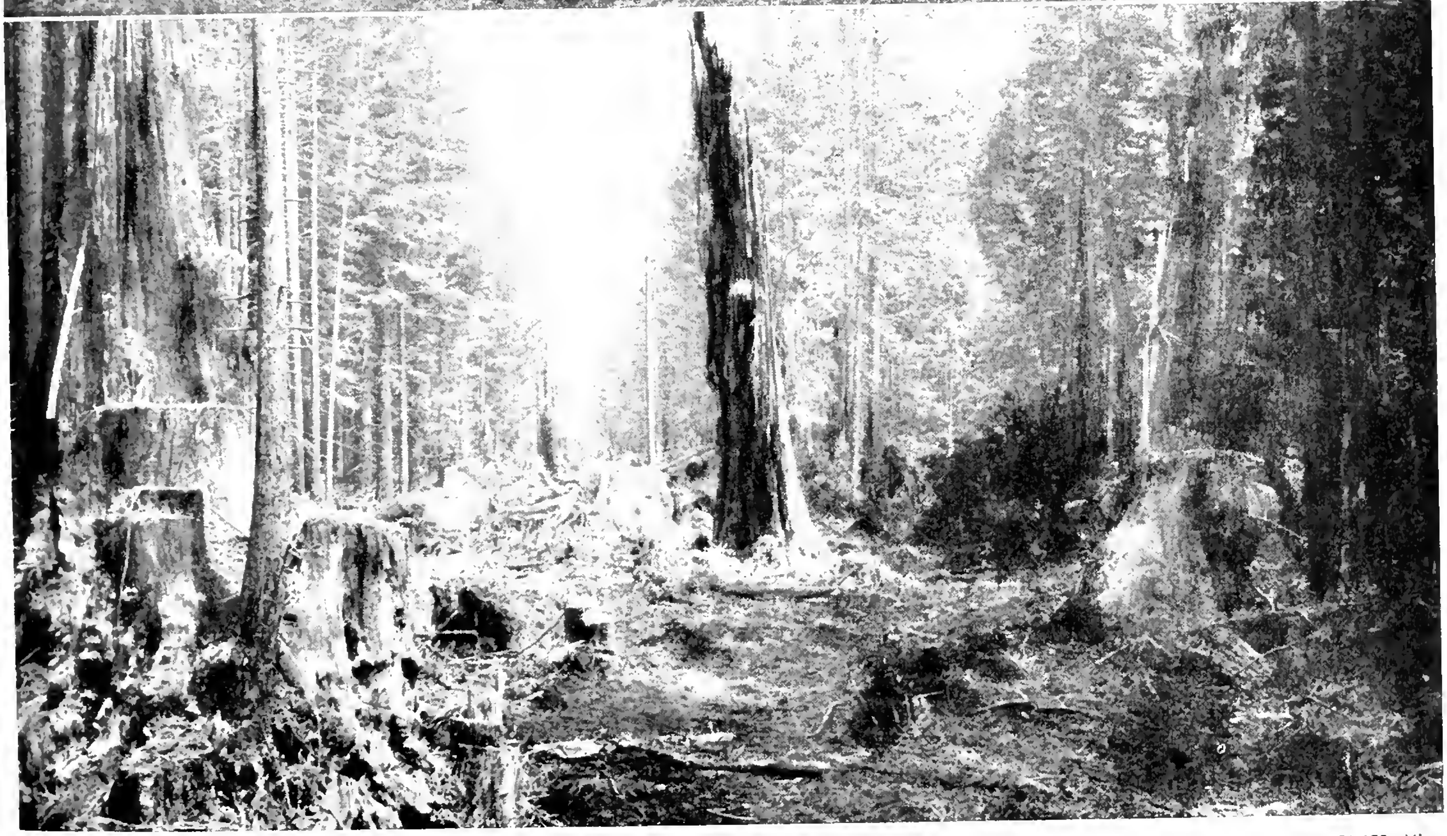
Limited Access Freeway

The completion of this contract early this fall will result in a graded roadbed on two-lane, limited access freeway standards of the 5½-mile portion of US 101. The base and surfacing are to be placed next year under separate contract. When completed, this portion will by-pass a 9½-mile section of US 101 which is narrow and winding with undulating grade and encroaching trees and stumps, which make hazardous driving conditions for the traveling public. The new alignment consists of long tangents with two intervening 25,000-foot radius curves and very light grades.

As can be seen from the accompanying photographs, the task of clearing the right of way for this project was one of major proportions—the majority of the alignment passes through dense redwood forests. Approximately one mile is through virgin timber, from which the owner was allowed to remove all merchantable trees prior to the start of this contract. Another three miles traverse a dense forest of second-growth redwoods with some spruce and fir.

This area was originally logged in the early 1890's, the logs being hauled away by bull teams to one of the first

LEFT: View of portion of existing US 101 showing type of alignment which will be by-passed by project on right



UPPER: This blasting scene has been repeated many times in order to remove the legion of stumps resulting from logging and clearing operations. LOWER: View showing clearing partially completed through an area of dense second-growth redwood forest. The large stumps resulted from logging operations in the 1890's. Approximately one-half of the new alignment passes through this type of forest.

mills in the county. The stumps left by this operation made the clearing job all the more difficult as they required considerable effort to remove. It was also necessary to remove a heavy blanket of humus throughout the forested areas. The remainder of the line passes through areas which vary from a heavy growth of alders to clear pasture land.

The task of cutting the trees and removing the stumps was big enough, but getting rid of the resulting mountains of debris was even greater. If

. . . Continued on page 63

Grand National

Freeways Facilitate Travel To Tenth Annual Exposition

Visitors from both near and far traveling by automobile to the 1954 Grand National Livestock Exposition, Horse Show and Rodeo at the San Francisco-San Mateo Cow Palace, October 29th to November 7th, will have a pleasanter, faster and safer ride than ever before in history.

This is the prediction of Nye Wilson, Secretary-Manager of the Cow Palace on the basis of a report from R. P. Duffy, Assistant District Engineer, District IV, Division of Highways, comprising the nine Bay counties, on freeway construction during the past 12 months.

The flow of traffic from the San Francisco side will be greatly facilitated by the recent opening of the Seventh Street off- and on-ramps to the Bayshore Freeway. These will relieve the congestion formerly apparent at the Ninth and Tenth Street ramps.

Traffic from the San Mateo peninsula will, for the first time this year, enjoy the full benefit of completed construction work in the vicinity of the San Mateo Bridge where all surface turns have been eliminated.

Construction work is now in progress from the south city limits of San Mateo to Redwood City but traffic is being handled on the four-lane existing facility with little inconvenience.

Castro Valley Freeway

In Alameda County the freeway by-passing Castro Valley was opened to traffic in September of this year and will afford much relief in this area which is traveled by hundreds of exhibitors and thousands of spectators from the fertile San Joaquin Valley.

Expected to be completed before next year's show is the extensive construction work on the Waldo grade of the Redwood Highway, the north approach to the Golden Gate Bridge. Work is being so conducted that the existing four-lane traveled way is available to traffic during peak hours, with only limited restrictions.

Rex Allen, famous motion picture, TV and radio star, with his horse, Koko, who will be the headliner of the arena entertainment thriller at this year's Grand National

Construction on the Eastshore Freeway north and south of the San Francisco-Oakland Bay Bridge is also being so conducted that little inconvenience is experienced, Mr. Duffy stated.

Tenth Anniversary

The Grand National will not only be easier for the visitor to reach this year but it will have one of the greatest attractions of all time in its arena show. In observance of its tenth anniversary, the huge exposition is going western in a big way.

The "Show of National Championships," will play 14 performances within the 10 days of October 29th to November 7th in the Cow Palace.

Rex Allen, famous motion picture, TV and radio western star and his horse, Koko, accompanied by the Arizona Wranglers, will headline the arena show bill.

Another feature with a western flavor will be the Boom Town Ballet, a company of beautiful dancers who will put on two numbers, one in modern cowgirl costume and the other a can-can straight out of the old time cow town dance halls.

In addition to being the last big rodeo of the year for points towards the Rodeo Cowboys' Association championships, the Grand National has once more been designated as the International Rodeo Association Championship Finals Show.

Grand National Horse Show

The Grand National Horse Show has again been selected for the National Cutting Horse Association Championship Finals and the American Horse Shows Association Medal Class National Finals, Stock Seat for Juniors. There will also be classes for western reined stock horses and trail horses as well as the fine horse classes.

A total of $155,361 is being offered in cash premiums, prizes, purses, and added entry fees at this year's Grand National. Division of premiums, as announced by Porter Sesnon, President of the Cow Palace Board of Directors, is: livestock premiums, $89,261; horse show prizes, $31,100; rodeo purses $21,000 to which will be added all rodeo entry fees, estimated at $14,000.

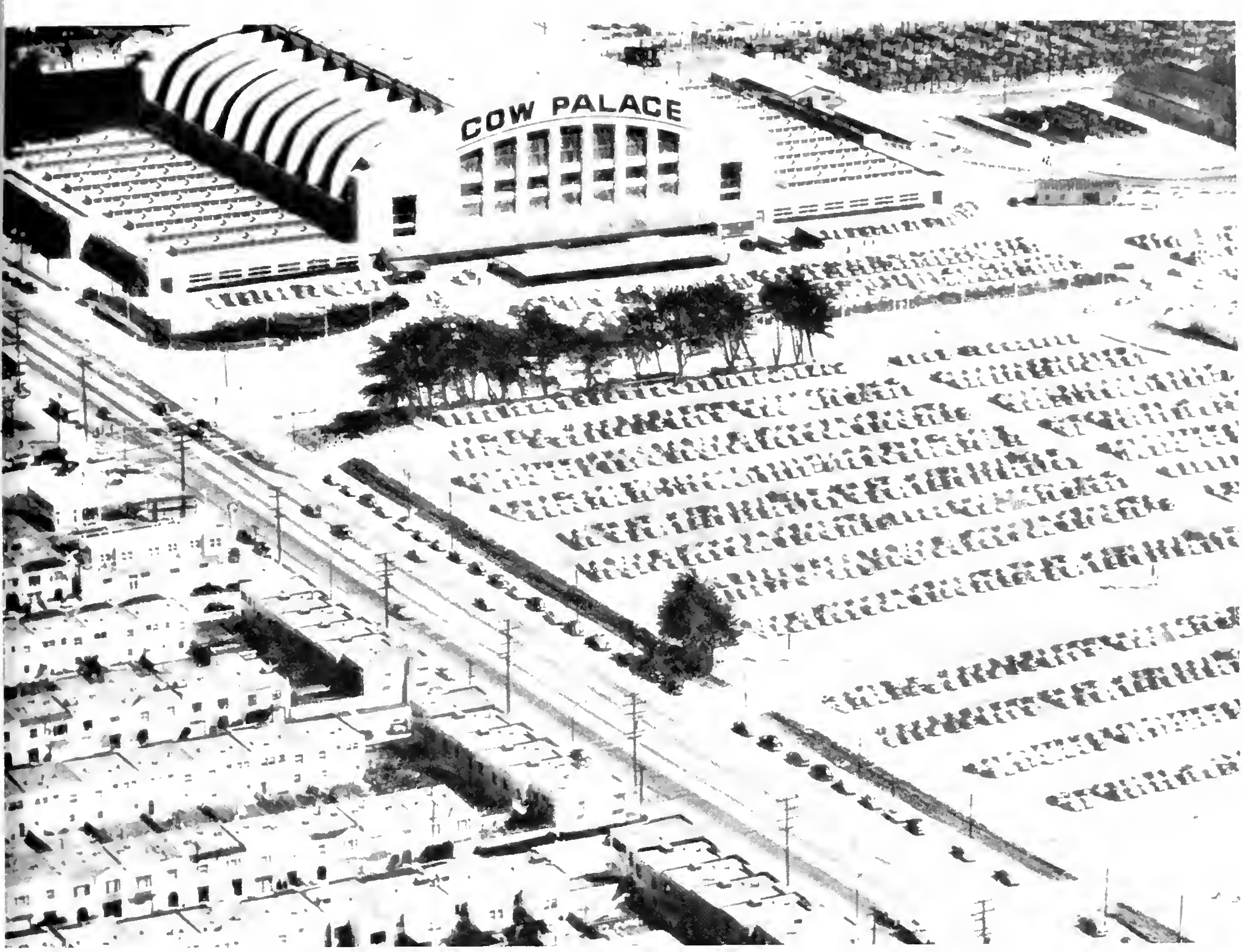
Highlights in the livestock division will be the American Aberdeen-Angus Breeders' Association National Show and Sale and the Columbia Sheep Breeders Association of America National Breeding Sheep Show and Sale.

Sponsored by State Agency

The arena show alternates events of world championship rodeo with classes of a national full division horse show and famous arena specialty acts, to provide a thrilling change of pace, breath-taking action, color and rhythm.

Ticket prices for the 8,523 arena show reserved seats will be: $2, $2.50, $3 and for box seats $3.50. There will be 2,404 unreserved seats for each performance at $1.25. Parking for 4,000 cars will be available at 50 cents.

Mail orders for choice reserved seats are now being received. Orders should be addressed to Cow Palace,



This is an aerial photograph of the famous San Francisco-San Mateo Cow Palace

San Francisco 24, California. Reserved seats are also on sale in San Francisco at the Cow Palace and at Crane Box Office, 245 Powell Street; in Oakland at Sherman Clay & Co., Broadway and Hobart Street, and outside the San Francisco Bay area at all Greyhound bus depots and ticket agents in Northern California.

The Grand Nationals are sponsored by No. 1-A District Agricultural Association, a State of California agency, the members of whose board of directors devote a large segment of their valuable time to Cow Palace affairs without remuneration. The officers are Porter Sesnon, President; Wilson Meyer, First Vice President; Roland Tognazzini, Second Vice President; Lawrence Draper, Jr., Louis G. Conlon, John Lawler, J. W. Mailliard, III, and Fred D. Parr.

BAY BARRIER

Continued from page 29 . . .

know is how much salt water will flow uphill.

The task the scientists from the University of Washington are undertaking is to establish the most complete and detailed information in existence anywhere in the world on the subject of salt-water intrusion through ship locks.

The ship locks at Seattle, which connect the salt water of Puget Sound to the fresh water of Lake Washington, are the second largest in the western hemisphere, being exceeded in size only by the Panama Canal locks.

The University of Washington scientists, headed by Dr. Clifford A. Barnes, nationally known oceanographer, are measuring the continually changing salt content and temperature of the water in the lock. Normal lock operation will not be interrupted during the measurements so that the experiments will reflect actual conditions. An additional series of measurements will be obtained from the six-foot diameter drain used to remove salt water from the lake. All measurements are being made with special electronic equipment. The University of Washington had some equipment on hand, but not enough to make the extensive simultaneous measurements specified by the Division of Water Resources. Dr. Barnes was able to borrow some equipment from Johns Hopkins University in Baltimore, Maryland, and the United States Navy Electronic Laboratory shipped a complete set of electronic measuring devices from Norfolk, Virginia.

STATE CHAMBER OF COMMERCE SUBMITS HIGHWAY PROGRAM

On August 26th the California State Chamber of Commerce submitted to the Highway Commission in Sacramento recommendations for state highway improvement projects for all of the State's 58 counties, in line with a long established custom. The projects included many recognized highway deficiencies that will require a score of years to eliminate.

The formal proceedings before the commission were presided over by F. W. Tarr, Chico, Vice Chairman of the chamber's State-wide Highway Committee. The chamber's six regional councils' recommendations were presented by the following: William J. Tunison, Westwood, Chairman, Sacramento Valley Council Highway Committee; A. J. Vanderschoot, Santa Rosa, Chairman, North Coast Council Highway Committee; Claude T. Faw, Berkeley, Chairman, Central Coast Council Highway Committee; Irving Symons, Sonora, Chairman, Central Valley Council Highway Committee; Charles S. Ehrhorn, Visalia, Chairman, San Joaquin Valley Council Highway Committee; and Kenneth Kendrick, Los Angeles, Vice Chairman, Southern California Council Highway Committee.

The California State Chamber of Commerce tendered to the Highway Commission its annual luncheon at the Sutter Club, Sacramento, on August 26th. LEFT TO RIGHT, STANDING—V. M. Mair, North Coast District Manager, State Chamber of Commerce, Santa Rosa; Harold Springer, Orange County Road Commissioner, Santa Ana; Heinz Kaiser, Orange County Supervisor, Santa Ana; C. M. "Max" Gilliss, Special Representative, Director of Public Works, Sacramento; J. E. Jellick, Manager, Portland Cement Information Bureau, San Francisco; T. Fred Bagshaw, Special Assistant to the Director of Public Works, Sacramento; Claude Minard, Director, California Railroad Association, San Francisco; A. J. Vanderschoot, Chairman, North Coast Council Highway Committee, State Chamber, Santa Rosa; John Branson, John Branson Company, Sacramento; H. V. Starr, Manager, Civic Development Department, San Francisco Chamber of Commerce; Robert M. Shillito, Assistant General Manager, San Francisco Chamber of Commerce; Vernon G. Smith, Kern County Road Commissioner, Bakersfield; C. E. Bovey, Engineer of City and Cooperative Projects, Division of Highways, Sacramento; Douglas C. Mackenzie, City Engineer, Pasadena; R. M. Gillis, Deputy State Highway Engineer, Division of Highways, Sacramento; Harmer E. Davis, Director, Institute of Transportation and Traffic Engineering, University of California, Berkeley; H. B. LaForge, Engineer of Federal Secondary Roads, Division of Highways, Sacramento; Ross T. Shoaf, Traffic Engineer, City Engineer's Office, San Francisco; Howard J. Reamer, Willow Point Ranch, Clarksburg; George J. Tschumy, Tulare County Abstract Company, Visalia; Martel Wilson, Regional Vice President, Central Valley District, State Chamber, Stockton; Bruce Craver, Manager, Stockton Chamber of Commerce; R. H. Wilson, Assistant State Highway Engineer, Division of Highways, Sacramento; Corbin Shepherd, President, Stockton Chamber of Commerce; Robert E. Reed, Chief Counsel, Division of Contracts and R/W, Division of Highways, Sacramento; William J Tunison, Chairman, Sacramento Valley Council Highway Committee, State Chamber, Westwood; George N. Cook, Assistant Secretary, California Highway Commission, Sacramento; Charles E. Waite, Assistant State Highway Engineer, Division of Highways, Sacramento; Chester W. Walker, Vice Chairman, Sacramento Valley Council Highway Committee, State Chamber, Hamilton City; Sam R. Kennedy, Los Angeles County Road Commissioner, Los Angeles; Matt English, Secretary, Metropolitan Traffic and Transit Committee, Los Angeles Chamber of Commerce; J. P. Murphy, Principal Highway Engineer, Division of Highways, Sacramento.

LEFT TO RIGHT, SEATED—Clark Galloway, Southern California District Manager, State Chamber, Los Angeles; Leonard S. Masias, Chairman, Traffic and Highway Committee, San Francisco Chamber of Commerce; Kenneth Kendrick, Vice Chairman, Southern California Council Highway Committee, State Chamber, Los Angeles; Claude T. Faw, Chairman, Central Coast Council Highway Committee, State Chamber, Berkeley; A. H. Clark, Vice Chairman, Central Coast Highway Committee, State Chamber, Soledad; Floyd Howe, Secretary, Coalinga Chamber of Commerce, Coalinga; E. E. Hall, Avenal; Ernie Fleming, Coalinga Chamber of Commerce; James A. Guthrie, San Bernardino; Charles T. Leigh, San Diego; Robert E. McClure, Los Angeles, members of Highway Commission; Frank B. Durkee, Director of Public Works and Chairman, Highway Commission; F.W.Tarr, Vice Chairman, State-wide Highway Committee, State Chamber, Chico; George T. McCoy, State Highway Engineer, Sacramento; H. Stephen Chase, Member, Highway Commission, Sacramento; F. Walter Sandelin, Member, Highway Commission, Ukiah, Frank J. Gasper, Quincy; Lewis E. Arnold, Engineer of Administration, City of Los Angeles; Irving Symons, Chairman, Central Valley Council Highway Committee, State Chamber, Sonora; Stanley Wakefield, Vice Chairman, Central Valley Council Highway Committee, State Chamber, Oakdale; Sidney L. Cruff, Chairman, Fresno County Board of Supervisors; Charles S. Ehrhorn, Chairman, San Joaquin Valley Council Highway Committee, State Chamber, Visalia; Frank C. Balfour, Chief Right of Way Agent, Division of Highways, Sacramento; F. W. Panhorst, Assistant State Highway Engineer, Division of Highways, Sacramento.

TWENTY-FIVE-YEAR AWARDS ARE PRESENTED

Director of Public Works Frank B. Durkee has presented 25-year awards to the following employees of the Division of Highways who have served the State for a quarter of a century.

ELIGIBLE ON APRIL 30, 1954

	Total service Yrs.	Mos.	Days
Shop 11			
Berry, Horace S.	25	0	25
District X			
Lewis, Karl F.	25	0	13

ELIGIBLE ON JUNE 30, 1954

	Yrs.	Mos.	Days
District I			
Lovering, W. R.	25	0	28
District II			
Crews, Edmund N.	25	0	6
Jacobsen, Wilbur	25	0	0
District III			
Hawkins, Albert L.	25	0	25
District IV			
Buchanan, Alvin F.	25	0	25
Doherty, Daniel	25	0	18
Frank, Dorothy R.	25	0	7
District V			
Garcia, Kenneth M.	25	0	1
Jensen, James R.	25	0	11
District VI			
Hughes, Patrick O.	25	0	24
Ostrander, Robert H.	25	0	7
Roush, Frank M.	25	0	0
Schell, Paul H.	25	0	1
District VII			
Garlinghouse, Sally	25	0	15
Keller, Henry J.	25	0	10
Sedgwick, William D.	25	0	23
District X			
Arsate, Henry	25	0	6
District XI			
West, Melbourne H.	25	0	4
Shop 4			
Kampschmidt, Oscar A.	25	0	14
Shop 5			
Ball, David L.	25	0	26
Central Office			
Bradt, Elrod R.	25	0	16
Chertorisky, V. L.	25	0	14

ELIGIBLE ON JULY 31, 1954

	Yrs.	Mos.	Days
District I			
Maciel, John V.	25	0	25
District III			
Kinney, Clarence W.	25	0	29
Roy, L. Ernest	25	0	6
District IV			
Johnson, Frank H.	25	0	6
Moses, Herbert Lea	25	0	4
Dietschy, John O.	25	0	1
District VI			
McClaine, John M.	25	0	14
England, Frank B.	25	0	1
District VIII			
Stone, Kent B.	25	0	22
District X			
Alonzo, Fermin P.	25	0	16
Rodemer, Frank A.	25	0	6
Potter, Richard V.	25	0	1
District XI			
Kerr, Philip S.	25	0	24
Bridge Department			
Gilbert, A. K.	25	0	7
Bay Bridge			
Hamilton, Carl S.	25	0	0

ELIGIBLE ON AUGUST 31, 1954

	Yrs.	Mos.	Days
District I			
Cox, Henry J.	25	0	23
Remore, Neil	25	0	15
District II			
Allen, Harry C.	25	0	0
District III			
Johns, Harry W.	25	0	6
District IV			
Arneal, Raleigh L.	25	0	27
Gaberel, Leroy C.	25	0	8
Lamas, Charles E.	25	0	5
District V			
Martin, Manuel	25	0	17
Jeppesen, Niels J.	25	0	6
District VIII			
Cowgill, John M.	25	0	28
Smith, Thomas E.	25	0	15
District XI			
Murdock, Earl J.	25	0	23
Shop 11			
Sears, Ben P.	25	0	4
Central Office			
Womack, J. C.	25	0	11
Reynolds, Frank M.	25	0	4

ALAMEDA COUNTY SUBMITS HIGHWAY PROJECTS

Officials of Alameda County and of 11 cities and representatives of civic organizations, on August 27th, submitted to the California Highway Commission their recommendations for highway projects for the 1955-56 budget.

Following their annual custom, the Oakland Chamber of Commerce and the Alameda County Highway Advisory Committee tendered a luncheon to the highway commissioners, officials of the Department of Public Works and engineers of the Division of Highways at the Sutter Club in Sacramento.

William Sparling, General Manager of the Oakland Chamber of Commerce was in charge of arrangements. The Alameda County delegation included:

Alameda County

Harry Bartell, Supervisor, Alameda County and Chairman, Advisory Committee; Clifford Wixson and Kent Pursel, Supervisors; Wallace Boggs, Alameda County Surveyor; George Herron, Administrative Assistant to County Surveyor; Francis Dunn, Jr., Assemblyman; Randall Dickey, Assemblyman.

Oakland

Clifford E. Rishell, Mayor; Hilliard Wilson, Acting City Manager; John A. Morin, City Engineer; Kendric B. Morrish, President, Oakland Chamber of Commerce; James Carey, City Treasurer.

San Leandro

Thomas O. Knick, Mayor; Wesley McClure, City Manager; Charles P. Martin, former City Engineer; Frank King, Manager, San Leandro Chamber of Commerce; Don Wells, San Leandro Chamber of Commerce.

Alameda

Leland W. Sweeney, Mayor; Carl Froerer, City Manager; S. Chesley Anderson, Vice Mayor; Sherwood Jones, City Councilman; William McCall, City Councilman; J. P. Clark, City Attorney; Henry Maggenti, Alameda Chamber of Commerce; Vic Cangi, Manager, Alameda Chamber of Commerce; Mrs. Moresi, Alameda.

Hayward

Lohn Ficklin, City Manager; Carlos Bee, City Councilman; Fred Cox, Past President, Hayward Chamber of Commerce; Roger W. Anderson, Manager, Hayward Chamber of Commerce.

Berkeley

Samuel C. Jacka, Director of Public Works; William Hunrick, Jr., City of Berkeley

Piedmont

George Mattis, representing City of Piedmont.

Washington Township

Manuel Hidalgo, President, Chamber of Commerce.

Centerville

William I. Short, President, Chamber of Commerce; Dan Irwin, Chamber of Commerce.

Newark

Arthur W. Cotton, President, Chamber of Commerce; Gordon Cotton, President, Kiwanis Club.

Livermore

Joseph T. Smith, Manager, Chamber of Commerce; C. G. Clarke, William Dear.

Niles

Stuart Nixon, Editor and Publisher, *The Township Register*, Niles.

Vital Link

San Luis Obispo Freeway Completed in August

By E. J. L. PETERSON, District Engineer

Another vital link, which will ultimately make US 101 between Los Angeles and San Francisco a multilane freeway, was completed on August 27, 1954, through San Luis Obispo.

This four-lane divided freeway will completely by-pass the business district of San Luis Obispo. Since US 101 north and south of San Luis Obispo carries approximately 9,000 cars per day, a large proportion of which do not stop in San Luis Obispo, the traffic congestion on the city streets has been greatly reduced. Many on and off ramps to the freeway will provide convenient connections for those desiring to visit in the city.

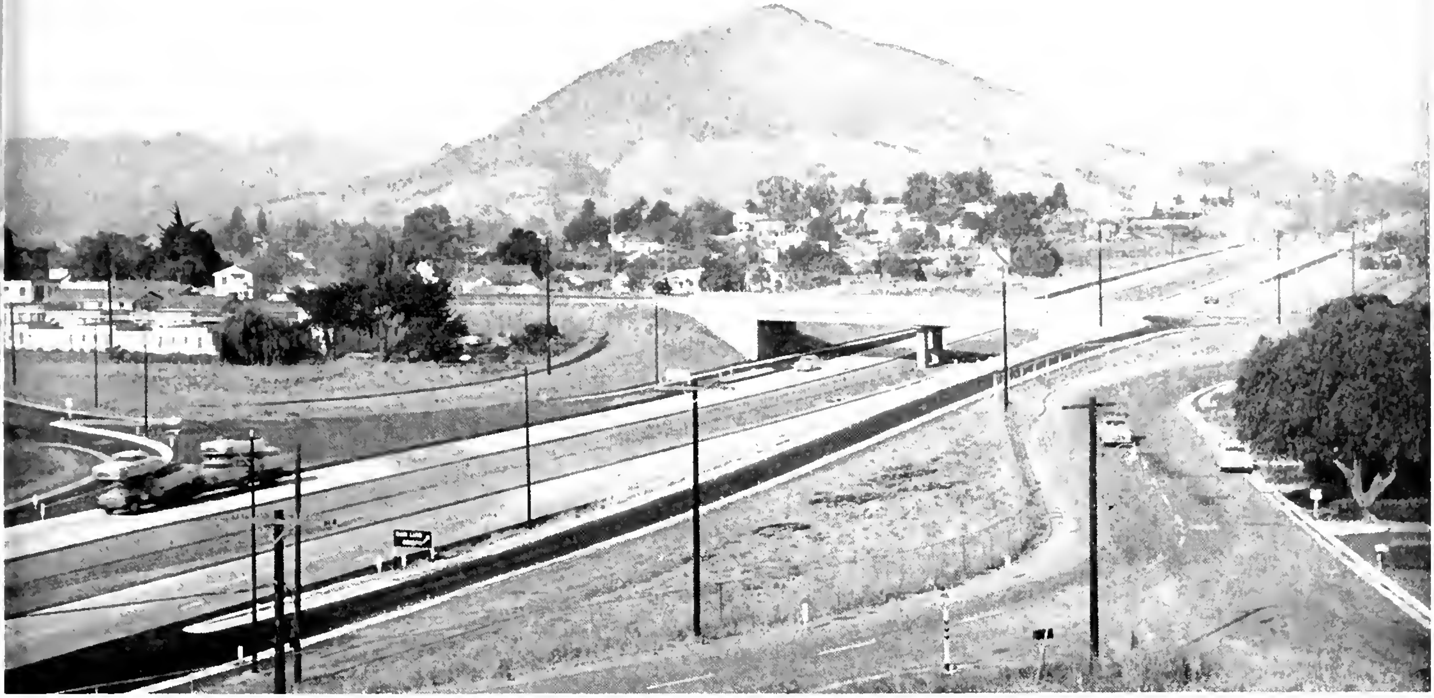
Bridge Construction

The initial work on this project began with the award of a $527,769 contract to the Granite Construction Company, Watsonville, California, on September 4, 1951, for the construction of two reinforced concrete bridges located at Santa Rosa Street and Ida Street, and a steel plate girder bridge carrying two tracks of the Southern Pacific Railroad over the freeway.

The second structure contract was awarded to the C. B. Tuttle Company, Long Beach California, for a $402,833 contract on January 28, 1952. This contract called for the construction of three reinforced concrete bridges and one existing bridge to be widened. One of these structures is located at the intersection of the freeway with an extension of Marsh Street, and with on and off ramps make up the Marsh Street Interchange. The second was the construction of a double 12 feet x 12 feet reinforced box culvert, approximately 229 feet long, carrying the water of Stenner Creek under the freeway. The third bridge was a reinforced structure on the freeway over Chorro Street which now is one of the main arterials connecting the southwest residential area of San Luis Obispo to the business district. The existing bridge on Broad Street, which crosses Stenner Creek, was widened to accommodate two-way traffic and serve as an off and on ramp from the freeway to this section of the city.

The third and last bridge contract was awarded to the Thomas Construction Company, Fresno, California, on May 5, 1952, in the amount of $205,513. This contract consisted of a freweay overpass over Grand Avenue and Buena Vista Avenue overpass over the freeway, both of which were reinforced concrete bridges.

Looking north from California Boulevard overpass showing on and off ramps at this location



Looking south, showing Buena Vista Overpass in the foreground, with outer highway serving Monterey Heights in the immediate foreground. Mt. San Luis in the background.

Freeway looking north from Santa Rosa Street Overpass on ramp to business district in the right foreground. Off ramp from State Route 56 in the left foreground. Santa Lucia Mountains in the distance.

Looking south from Santa Rosa Street overpass, showing on and off ramps from business district of San Luis Obispo

Grading

Prior to the completion of all of the bridges the grading of the freeway between Marsh Street and San Luis Obispo was begun. The low bid on this phase of the project was submitted by the Madonna Construction Company, San Luis Obispo, in the amount of $576,696 and was awarded to the firm on January 16, 1953.

In addition to the grading on the freeway on and off ramps were built; city streets connected or new ones constructed for use of local traffic.

Paving and Lighting

The last major contract on the freeway was for the paving and was awarded to Fredrickson and Watson Construction Company, Oakland, California, on December 17, 1953, in the amount of $576,620. This work consisted of placing four 12-foot lanes of Portland cement concrete pavement eight inches in thickness over four inches of cement-treated base; constructing Portland cement concrete curbs and gutters on all on and off ramps and paving these with plant-mixed surfacing.

The contract for installing illuminated signs and luminaires was awarded to the Howard Electric Company, Gilroy, California, on April 1, 1954, and this part of the project will cost $52,932.

Overhead lights are located on all on and off ramps to minimize the accident factor of merging traffic at these locations.

The last of this series of contracts in connection with the San Luis Obispo Freeway will be undertaken in the near future. This project will be for erosion control work, and in this area it is most essential in order to retard excessive soil scour and keep roadside maintenance to a minimum.

Traffic Relief

San Luis Obispo is located half way between Los Angeles and San Fran-

Looking north from Marsh Street on ramp. Santa Lucia Mountains in the background cisco on US 101. With through traffic now using the freeway, the narrow city streets will function most efficiently both from a safety standpoint for the pedestrians and the heavy vehicular traffic at the major street intersections.

The construction of the freeway through the City of San Luis Obispo provides a continuous four-lane highway between Pismo Beach and one mile south of Santa Margarita, a distance of approximately 20 miles.

San Luis Obispo is situated at the foot of the well-known Cuesta Grade, which is located to the north of this city. Several trucks in the past years have lost their brakes or had a broken driveshaft in descending this 7 percent mountain grade, causing the vehicles to go out of control and at the bottom attaining speeds in excess of 75 to 80 miles per hour and wrecking in the business section of the city. The completion of the freeway eliminates this hazard, as these runaway vehicles will no longer have to go through the business section of the city.

MAGAZINE SERVES PURPOSE

LOS ANGELES, CALIFORNIA
6229 Miramonte Boulevard

DEAR MR. ADAMS: I feel that the *California Highways and Public Works* magazine is doing fine work. When anyone complains to me that there is too much money spent on highways, I take the magazine and show them the wonderful work being done, not only in highways, but in public works. It changes their ideas.

I wish to congratulate you on the wonderful way you present facts to the public on these matters. I am,

Very truly yours,
JOHN E. WRIGHT

WE HOPE SO

SANTA ANA

Division of Highways
Sacramento

I think your magazine far excels any publication of the kind that I have ever seen.

Yours truly,
DAN E. MALONEY

WINTER ROAD CONDITIONS ON THE AIR

By R. D. KINSEY, Assistant District Engineer

The California Division of Highways, through the medium of the United States Weather Bureau teletype System, presented to the people of California during last winter concise, up-to-date and last minute reports on California highway conditions throughout the State.

These reports have been made available through the operation of the State Division of Highways Radio Communication System and the use of teletype. In Los Angeles and San Francisco through the use of a teletype connection to the United States Weather Bureau Teletype System, and in Sacramento on a separate teletype system, road information is transmitted direct to interested parties.

The various news services and some newspaper organizations had previously taken advantage of connections to the Weather Bureau Teletype System in order to obtain weather forecasts and information for their publications. Since the use of the Weather Bureau Teletype System by the Division of Highways in transmitting up-to-date, last minute road information, automobile clubs, additional newspapers and other parties have taken advantage of this system with the result that rapid dissemination of this information has been made available to a very large portion of the people of California.

Vice President Arthur Hull Hayes of Columbia Broadcasting System and General Manager of KCBS receiving last minute road conditions in Division of Highways radio room in San Francisco from dispatcher clerk, California Williams. Photo by KCBS.

Augmenting this last source of information, Radio Station KCBS, affiliate of the Columbia Broadcasting System in San Francisco, has installed in its radio newsroom a teletype receiver on the Weather Bureau Circuit and is broadcasting to radio audiences complete and detailed weather and road reports from this system. As a result, it renders a very great public service to the residents of California and adjoining states.

Artesia Street

Progress in Converting Route 175 Into Four-lane Divided Highway

By HAIG AYANIAN, Senior Highway Engineer

The completion of the contract 54-7VC5-F on Route 175, Artesia Street, in Los Angeles County brings one step closer the fulfillment of the need for a through route from the Redondo Beach area to inland Orange County points. This project is another link of a modern divided state highway traversing, in most part, highly developed areas.

Artesia Street, or Redondo Beach Boulevard and 174th Street in the westerly area, will also serve as an interconnector between the 10 state routes which it intersects. It is important to note that four of these routes are established or proposed freeways. This highway will fill the need of a good east-west road between Pacific Coast Highway and Firestone Boulevard, a distance of about 11 miles, and is about halfway between them.

To the present time, the construction has consisted of rebuilding existing streets into a modern four-lane divided highway. However, two contracts have just been let for the final links of this route which will entail entirely new construction as no traversed way existed. The completion of these two contracts should be the occasion for a real celebration among the motorists traveling between the Redondo Beach area and points to the east.

Alignment Details

The contract provided for the construction of a four-lane divided highway from Inglewood Avenue easterly to Normandie Avenue, a distance of 3.63 miles. This work is in the three cities of Redondo Beach, Torrance, and Gardena. Existing 174th Street consisted of a narrow plant-mixed surfaced street in poor repair but more or less surrounded by new subdivisions. All of this street was removed during construction as very little of it was of such quality that it could be utilized even for a base.

The westerly portion of the project from Inglewood Avenue to Casimir Avenue is over 100 feet of right of way, each roadway 32 feet between curbs, median width 16 feet between gutters, and 10 feet from outside curb to right of way line. The easterly portion of the project from Casimir Avenue to Normandie Avenue is over 110 feet of right of way, each roadway 36 feet between curbs, median width 18 feet between curbs, and 10 feet from outside curb to right of way line.

The centerline of the new construction follows the centerline of existing streets with two exceptions: where Route 175 departs from Redondo Beach Boulevard, the centerline of Route 175 heads to the intersection of 174th Street and Hawthorne Avenue, (Route 164); at the crossing of the Atcheson, Topeka & Santa Fe Railway where new alignment is necessary as the existing underpass is used to span the eastbound roadway. The westbound roadway utilizes the new extension of the underpass constructed under this contract. The new alignment is a series of reversing curves with radii of 3,500 feet. The deflection angles along the centerline elsewhere are so small that curves are not necessary.

The structural section in general consists of four inches of asphalt concrete pavement on eight inches of untreated rock base under which was placed one foot of imported subbase material. The westerly portion of the contract was through native material of high enough quality that the untreated rock base could be placed on the basement soil.

Drainage Problems

The area traversed by Route 175 from Arlington Avenue eastward is drained by the Dominguez Channel of the Los Angeles Flood Control District. This channel crosses the project twice. At both crossings batteries of seven 72-inch corrugated metal pipe were placed. These provided facilities equal to or superior to those which existed prior to construction. These are considered ample for the capacity of the channel.

The Los Angeles Flood Control District does not expect to undertake the channel improvement in this area for 10 years. At that time funds will be available and bridges will be constructed to replace the multiple pipes. Until this channel is constructed to its ultimate grade and width, the roadway in this area will be subject to flooding during high intensity storms. To provide for this, the slopes around the pipes were paved with asphalt concrete.

The underpass is known locally as the East Redondo Beach Underpass and consisted of a through girder steel bridge of about 41-foot span carrying a single track railroad. The existing roadway was lowered about 18 inches for the exclusive use of the eastbound roadway. The north abutment was converted to a pier by the construction of a bearing wall for the new bridge of about 41-foot span to carry the railroad across the new westbound roadway. It was necessary to construct a timber piling shoofly to carry the trains around the site of the construction and this work was performed by the Atcheson, Topeka & Santa Fe forces.

The project included the following major items of work:

Remove concrete	1,500	cu. yds.
Roadway excavation	115,000	cu. yds.
Structure excavation and backfill	5,500	cu. yds.
Imported subbase material	58,000	tons
Untreated rock base	66,000	tons
Asphalt concrete	28,000	tons
Class A P.C.C. (structures)	550	cu. yds.
72″ C.M.P. (10 ga.)	1,860	l.f.

The total cost of the project was approximately $1,000,000 and the contract was accepted on August 2, 1954. The contractor was J. E. Haddock Ltd., and the project was under the supervision of Neal Saul. The State was represented by L. W. Sixt a

UPPER: Looking westerly from Inglewood Avenue showing completed divided highway development along Redondo Beach Boulevard. LOWER: Looking easterly from Hawthorne Boulevard along completed 4-lane divided highway development on 174th Street.

Resident Engineer and Frank Feiler as Bridge Department representative.

UPPER: Looking westerly along State Highway Route 175 from Inglewood Avenue showing East Redondo Beach grade separation with Santa Fe Railroad. LOWER: Looking westerly along State Highway Route 175 showing intersection with Crenshaw Boulevard. This photograph shows construction details in central dividing strip in order to provide for left turning traffic movements.

Final Links

The present project is joined on the west by a recently completed section which carried the improvement westerly to Pier Avenue in Redondo Beach and provides direct connection to Route 60, Pacific Coast Highway. This project was, in general, to the same standards as the one under discussion.

The construction of the balance of Route 175 in this area is now progressing under two recently awarded contracts. Contract 54-7VC70-F covers the portion from Normandie Avenue to Main Street and Contract 54-7VC72-F covers that portion from Central Avenue to Alameda Street. Contract 54-7VC70-F originally called for the construction of a four-lane divided highway beginning at the easterly end of the recently completed contract 54-7VC5-F discussed above and joining at Main Street the westerly end of a portion completed prior to World War II.

After the start of construction the portion of Route 175 between Normandie Avenue and Alameda Street was declared a freeway by the California Highway Commission and steps were taken to revise the typical section to conform to the freeway standard with six lanes of divided highway having controlled access.

The work in general consists of about 1.4 miles of six-lane divided highway to be graded and surfaced with plant-mixed surfacing on untreated rock base and construction of a reinforced concrete slab bridge across a flood control channel. The cost of contract 54-7VC70-F is estimated at $538,000 and the contractor is the Sheets Construction Company of Gardena. The time set for completion is June, 1955. The State is represented by L. W. Sixt as Resident Engineer and H. L. Harger as Bridge Department representative.

Contract 54-7VC72-F originally called for the construction of a divided four-lane highway from Central Avenue, the easterly end of the portion completed prior to World War II, to Alameda Street where it will make connection to that portion of Artesia Street recently improved to a four-lane divided highway and which was described in a story by William D. McGinnis in the July-August, 1953, issue of *California Highways and Public Works*.

Contract 54-7VC72-F was also revised to conform to freeway standards after the start of construction. The work in general consists of grading a six-lane divided highway about

. . . Continued on page 59

Bituminous Paving

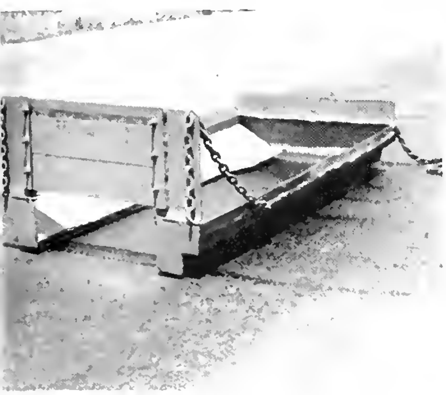
New Procedures for Hauling and Placing

By VAUGHN MARKER, Assistant Engineer, Headquarters Construction

On the recently completed Contract 53-3TC15-F, road III-Yol-6-C, Yolo Causeway to Tower Bridge, some different procedures for hauling and placing of plant-mixed surfacing were tried with considerable success. The basic difference which led to the alterations in placing methods was the change from end dump hauling units to the bottom dump type.

The foregoing change by the contractor was prompted by the desire to reduce hauling costs. This in turn demanded a new piece of equipment for use in conjunction with the bottom dump semitrailers and trailers in order to provide a controlled and uniform spread from the trucks. The ultimate result was a special spreader box for use with the bottom dump trucks which was designed and built by personnel of the Miles and Sons Trucking Service and provided the necessary control of spread in a satisfactory manner.

Spreader box used with the bottom dump hauling unit



Spreader box in position for next truck to use

Placing Procedure

The placing procedure consisted of dumping from the bottom dump hauling units into the spreader box which, when pulled by the trucks, left the material on the grade in a windrow of the desired size. In the case of the leveling course, this windrow

Windrow left by bottom dump hauling unit and special spreader box was then spread by a motor grader in the conventional manner. In order to utilize the hauling units for placing the surface course, however, a little more radical change was required. After the plant-mixed surfacing was placed in the windrow by the trucks, it was picked up by a mechanical loader and deposited into the hopper of a bituminous paving machine. This system worked out very successfully and gave a satisfactory surfacing.

Equipment string for placing surfacing course

Observations

Following are some observations made during paving operations using this procedure:

1. It was possible to operate the paving machine continuously without having to stop for each truck. This feature alone eliminates the cause for much of the surface irregularities that occur in asphaltic surfacings.
2. It was much easier for the paver operator to control his machine when pushing the loader than when pushing trucks.
3. Approximately 40 degrees of temperature was lost in the mix between the truck and paving machine. This loss occurred at a time when the air temperature was above 90° F. with little wind and it is possible that a greater heat loss would occur under different weather conditions. It is not believed, however, that heat loss will be a serious problem except in extreme cases.
4. Very little segregation of material occurred. The possibility exists for it to occur, but with a little care on the part of the loader operator this can be minimized.
5. The quantity of material being fed to the paver was easily controlled by sizing the windrow slightly larger than necessary, then leaving short gaps as required.
6. It is important that the windrow spread does not get too far ahead of the loader for two reasons:
   (a) Possible mechanical breakdown of the paving equipment.
   (b) To allow adjustment in windrow size as needed.
7. It is important that the loader pick up the windrow clearly so as not to leave any loose material under the tracks of the paver.
8. Droppings of accumulated fines from the loader must be kept picked up to prevent pads from bleeding up through the sufacing.
9. A re-combining cone or baffle at the end of the discharge belt of the loader as used for this job is mandatory, in order to reduce the possibility of segregation of the coarse and fine particles in the mix.

Loader and paver in operation on surfacing course

Spreader Box

The spreader box was 7 feet long, $3\frac{1}{2}$ feet wide, 9 inches high on the

Gap in windrow to control quantity being fed to paving machine

sides and with a 2-foot wide, variable height opening at the rear. The sliding gate at the rear was built into the backplate, which was hinged to fold down to the 9-inch height of the sides. When in position with the backplate upright, a chain on each side held the plate in place against the weight of the plant mix. A piece of belting 3 inches to 4 inches high was bolted to the sides of the box to prevent any spillage of material. The box was hooked to the truck by means of two chains that were fastened around the axle ahead of the box. The bottom of the box was open so that the mix discharging from the truck fell directly to the pavement between the skids on which the spreader box moved. As the truck moved forward, a sized windrow was left behind on the grade. With this configuration a very successful spread was obtained, coming out consistently within 10 feet in 275 feet. (275 feet was the average theoretical distance that one truck and trailer load of mix should have spread at the rate being used.) The main care that must be taken to insure a reliable spread is to hold the speed of the truck to the absolute minimum in all cases so that a contraction of the material coming through the opening in the spreader box will not occur, thereby leaving too small a windrow.

Limiting Factors

It must be noted that there were some limitations in the equipment and methods used on this project, although with certain modifications it would be possible to keep them to a minimum. The main limiting factors were:

a. With the size of opening in the spreader box, the maximum controlled windrow that could be placed was one which would provide a strip 13 feet wide and 1½ inches thick through the paver.

b. Where the working space was limited and where it was necessary for the trucks to back into position, hourly production fell off considerably due to poor maneuverability of the trucks.

c. On short radius turns such as occur on ramps, interchanges, etc., the trailer of the hauling unit will not track exactly and great care must be taken to prevent the wheels of the trailer from running over the spreader box when moving into position.

Saving in Hauling Costs

It is believed that the use of bottom dump trucks combined with the other equipment herein described (or some modification thereof) will result in a considerable saving in hauling costs which will eventually be reflected in lower bid prices for plant-mixed surfacing. In addition, there are certain other less tangible benefits as far as the actual pavement is concerned that should result from the method of placing. The equipment and methods described above appear to be among the more significant advances in asphaltic paving procedures noted in California in recent years. All of the equipment and methods complied with current specifications for the placing of asphaltic mixtures as required by the California Division of Highways.

The contractor on this project was B. J. Ukropina, T. P. Polich, Steve Kral, and John R. Ukropina. The work was under the general supervision of District Engineer A. M. Nash, with Muller Chapman the Resident Engineer. The superintendent for the contractor was Arthur "Swede" Ingwersen.

Fellowships Go To Three Young Road Engineers

Three young engineers of the Division of Highways have been granted leaves of absence to accept graduate fellowships awarded them earlier this year by the Automotive Safety Foundation.

Stephen George, Jr., Junior Civil Engineer with District VIII now stationed at Ontario, will attend the Bureau of Highway Traffic at Yale University.

Robert W. Crommelin, Assistant Highway Engineer with District IV in San Francisco, and Charles M. Roscoe, Assistant Highway Engineer with District I in Eureka, will carry on graduate study with the Institute of Traffic and Transportation Engineering at the University of California at Berkeley.

All three fellowships pay monthly living allowances plus fees for the 1954-55 school year.

Those awarded Automotive Safety Foundation fellowships must be graduate engineers. Preference is given to applicants with highway engineering experience subsequent to graduation.

Arcata Freeway

Unique Opening Ceremony Replaces Ribbon Cutting

By R. C. KENNEDY, Secretary, California Highway Commission

THE CITY OF ARCATA and its chamber of commerce were the hosts, on July 20, 1954, at the opening of the new freeway around Arcata. And they did themselves proud.

The legendary Paul Bunyan was brought to life and a large redwood log was used instead of the proverbial ribbon for the ceremonies of opening the road.

To start with, the Arcata Chamber of Commerce was host at a luncheon

UPPER: John Dickinson, Arcata Chamber of Commerce; Highway Commissioner, F. Walter Sandelin; Assemblyman Frank P. Belotti; Highway Commissioner, Robert E. McClure and Councilman Paul Ely, Arcata, on far right, watch professional logger using a chain saw. LOWER: The freeway is open.

On speaker's platform. Left to right: T. Fred Bagshaw, Department of Public Works; Commissioner Robert E. McClure, John Dickinson, Commissioner Walter Sandelin, Assemblyman Belotti and District Highway Engineer Allen S. Hart.

at the Big 4 Inn. The inn is located at the north end of the present construction, and made an ideal location for the luncheon.

City officials, county officials, representatives of the Bureau of Public Roads, and the California State Highway Commission were all called upon during the luncheon for a few remarks. F. Walter Sandelin, Highway Commissioner from Ukiah, was the main speaker.

Immediately after the lunch everybody piled into automobiles and started for the site of the celebration. The Arcata High School Band was out in full splendor. Music was a good part of the log-cutting ceremony.

The committee in charge had arranged a large redwood log on two trucks. The two trucks were back to back and about five feet apart. A board platform was built between the trucks.

John Dickinson was master of ceremonies at the luncheon and at the exercises at the log where civic leaders spoke. Speaker for the Highway Commission was Robert E. McClure, who lives in Santa Monica. At the invitation of Governor Knight, Mr. McClure had flown from Santa Monica to be at the celebration.

As soon as Commissioner McClure had concluded his remarks, a couple of old timber hands were called upon to use a crosscut saw. This they did for an inch or two into the log. Then a professional logger took over and using a motor-driven chain saw made short work of cutting through the log. As his saw made the last swipe at the log the fireworks started. Bombs burst in air and the band started to play.

The drivers of the trucks had been well trained for as soon as the saw had finished cutting through the log the platform was removed and the two trucks pulled apart. Half of the log was on each truck—after cutting—and, as the trucks drove away the freeway was declared open to traffic.

The men from Humboldt County had taken a page from the legend of Paul Bunyan.

Drainage Design Course Offered In Fifteen Cities

A four-meeting short course, "Drainage Design in Highway Practice," will be offered in 15 California localities beginning in October and extending into 1955, the Institute of Transportation and Traffic Engineering, University of California, has announced.

The course will cover the latest practice in drainage design, some of it deriving from research completed in various parts of the Country since the last course of this type was offered in 1951-52. Increased emphasis will be placed on storm drainage in urban and suburban areas, the institute's announcement said.

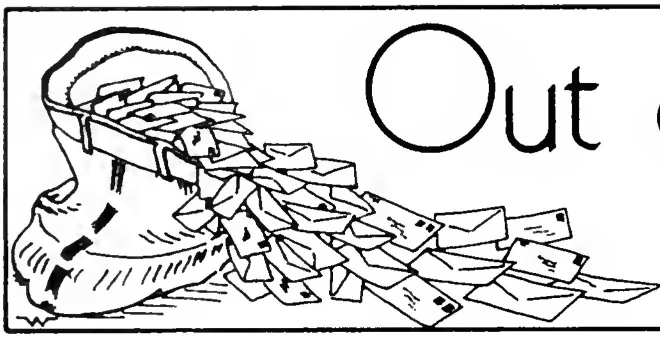
H. P. Pickering, ITTE assistant engineer, will conduct the course, presenting a series of illustrated lectures. Time will be provided for discussion of the possible application of the latest drainage design procedures to meet local conditions.

Meetings generally will be held on Friday evenings and Saturday mornings on the dates specified in the following communities:

Bakersfield, April 8, 9, 15, 16.
Berkeley, November 26, 27; December 3, 4.
Bishop, January 24, 25, 26, 27.
Eureka, June 3, 4, 10, 11.
Fresno, October 29, 30; November 5, 6.
Glendale, February 11, 12, 18, 19.
Long Beach, November 12, 13, 19, 20.
Marysville, April 22, 23, 29, 30.
Redding, May 13, 14, 20, 21.
San Bernardino, October 15, 16, 22, 23.
San Diego, December 10, 11, 17, 18.
San Jose, January 7, 8, 14, 15.
San Luis Obispo, March 11, 12, 18, 19.
Santa Rosa, February 25, 26; March 4, 5.
Stockton, March 25, 26; April 1, 2.

RASHNESS AND TIMIDITY

Good driving calls for a happy medium between rashness and timidity, says the California State Automobile Association. Rashness blends easily into recklessness, with serious consequences, while timidity causes a driver to react in ways not expected by others on the road. Don't be afraid of other drivers—but do cultivate a healthy respect for them.



Out of the Mail Bag

THANK YOU, DUD

PORT OF OAKLAND
Oakland 7, California
Office of the Manager

MR. KENNETH C. ADAMS, *Editor*

Again there passed over my desk the magazine *California Highways and Public Works.*

As I have wanted to do many times, I wish to express to you my admiration for the excellent job that is done by you in the publishing of this magazine. I thoroughly enjoy it, and always look forward to receiving it and going over it.

Again congratulations and best wishes for your continued success.

Sincerely,

DUDLEY W. FROST

LETTER FROM TOKYO

ROAD BUREAU
Ministry of Construction
Japanese Government
Tokyo

MR. G. T. MCCOY
State Highway Engineer

DEAR MR. MCCOY: I would like to express my sincere thanks for your kindness in placing me on the mailing list for your magazine, *California Highways and Public Works,* which I requested when I visited your office in Sacramento.

The March-April, 1954, issue of the magazine has arrived recently. I am thinking of putting it in circulation in our office for efficient use by the people concerned.

With best wishes and regards, I remain,

Very truly yours,

HIROMASA SATO
Chief, Road Planning Section
Road Bureau

FROM BRAZIL

IAGS, BRAZIL PROJECT
APO 676, c/o Postmaster
New York, N. Y.

California Highways and Public Works

DEAR SIR: I have enjoyed your magazine for many years and hope that I may go on receiving it for many more years to come. I was long a resident of California and now that I am working in Brazil, your magazine helps very much in keeping me posted on the latest developments in highways and freeways in California.

Sincerely,

JAMES B. CASE

DESERVED PRAISE

Stockton, California

MR. CLIFF TEMBY, *Assistant District Engineer*
State Division of Highways

DEAR CLIFF: You are to be congratulated on the excellent article which appeared in the issue of the *California Highways and Public Works* periodical. I think that you have given a most complete explanation, including pictures, of the good progress being made on the various highway projects in District X.

Likewise, the articles by Dick Potter, C. E. Moffatt, and Ken Wells are well prepared and visually described. I think it is well worth while to have articles such as these explaining highway construction projects broken down for the various districts.

Cordially,

EDWARD W. SIPE, Manager
Central Valley District
State Chamber of Commerce

OREGON WANTS MAGAZINE

CENTRAL PLANNING OFFICE
Lane County Planning Commission
Eugene Planning Commission
Springfield Planning Commission
Eugene, Oregon

California Highways and Public Works Publication
Sacramento, California

GENTLEMEN: It has been my privilege to occasionally see a copy of your very excellent publication on *California Highways and Public Works.* I would greatly appreciate being placed on your mailing list to receive copies for the purpose of stimulating advanced thinking among the administrative personnel and planning commissions in the central Oregon area.

Very truly yours,

HOWARD W. BUFORD
Director, Central Lane County
Planning Commission

VIEWS AND REVIEWS

L. HAROLD ANDERSON
San Francisco

MR. KENNETH C. ADAMS, *Editor*

I have just finished reviewing the May-June issue of *California Highways and Public Works* and I want to compliment you on the excellence of this publication. I have long been impressed by the quality of the magazine, the use of photographs, charts and maps, and I thought I would take the occasion to tell you my wishes.

Again, my compliments to you and your staff.

With warmest personal good wishes, I am

Sincerely,

L. HAROLD ANDERSON

FROM POMONA

POMONA BRANCH, COUNTY ASSESSOR
City Hall, Pomona

Mr. Kenneth C. Adams, *Editor*

Your excellent magazines receipted per my request. I wish to thank you for sending them to me and to commend you for the excellence of your publication. I enjoy it so very much. The photographs are splendid and the write-ups too. It helps me in my work.

Yours, etc.,
Edna Yerxa Miller,
Deputy Assessor

AUSTRALIA WRITES

COUNTRY ROADS BOARD
Divisional Engineer, Bendigo, Victoria

Kenneth C. Adams, *Editor*

Dear Sir: I was privileged to spend three weeks with your department and the Bureau of Public Roads, Sacramento, in July, 1953, studying highway practices and since my return to Australia the issues of your excellent magazine have served to keep me in touch with developments in your State.

May I say how much this service is appreciated and commend you and your staff for the high standard of the publication.

Yours faithfully,
F. West
Senior Divisional Engineer

FROM CANADA

34 Ivorwood Cres.
c/o Wexford P. O.
Ontario, Canada

Mr. Kenneth C. Adams, *Editor*

Dear Mr. Adams: I have been receiving copies of *California Highways and Public Works* for nearly two years. This magazine has been of considerable value to me in my work as Principal Assistant Traffic Engineer for the Ontario Department of Highways. The articles on the economic effects of freeways on adjacent land values have been of value to me in my studies on the necessity of controlling access to expressways.

L. O. Feander

ARTESIA STREET

Continued from page 52 . . .

2.2 miles in length and surfacing with plant-mix surfacing on untreated rock base and constructing two steel plate girder bridges.

The first of these bridges will carry the highway over the tracks of the Pacific Electric Railway and the second bridge is a combination structure that will carry the highway over Compton Creek, over the tracks of the Southern Pacific Railroad, and over Alameda Street. The contractor is the Vido Kovacevich Company and O. B. Pierson of Rosemead, and the cost will be about $1,700,000. The completion date for the contract is set for November, 1955. C. C. French is Resident Engineer for the State, and F. B. Donovan is Bridge Department representative.

EXPRESSES THANKS

GORDON F. ROGERS
Consulting Engineer
Berkeley 5, California
August 23, 1954

Mr. Ralph Kinsey
Division of Highways
San Francisco, California

Dear Mr. Kinsey: I want to thank you for your cooperation last Saturday night in leaving your home in the middle of the night to issue a permit to Bigge Drayage Co. This emergency work was being done at my request. Sunday afternoon it was a great satisfaction to me to see this bulky equipment at work salvaging grain from a burning storage tank. With the assistance of this equipment working 24 hours per day we hope to save most of $400,000 worth of barley that was stored in one tank.

Thank you for your help in my emergency.

Yours very truly,
Gordon F. Rogers

MAGAZINE SAME AS TRAVEL

JOSEPH C. SCHILL, O.D.
Tulare, California

Kenneth C. Adams, *Editor*

Dear Mr. Adams: We are happy to see the magazine come and for a lay office, we read it very thoroughly. It has been and still is in constant use in our reception room.

Yours very truly,
Joseph C. Schill, O.D.

Greeley Award Is Given to F. W. Montell

The American Public Works Association has presented to Supervising Highway Engineer F. W. Montell, District IV, San Francisco, the Samuel A. Greeley Service Award for this year. The award was made at the annual meeting of the association, held in Atlantic City on September 22d.

This award is made in recognition of professional achievement to eligible members of the American Public Works Association who have maintained their membership for five years and have at the same time completed a period of at least 30 years of continuous service with the public works agency with which they are presently associated.

Montell is the first California Division of Highways member of the organization to receive this award. He began his service with the Division of Highways in July, 1923, when he accepted a position as chairman in District IV. After working at that location for one year, he returned to college, and in June, 1925, accepted a position in District IV, where he has since been continuously employed in a variety of engineering assignments.

Montell is presently Assistant District Engineer assigned as head of the District IV Cooperative Projects Department.

KEEP PACE WITH TRAFFIC

Accidents can be avoided by keeping pace with the rest of the traffic on a road or street. Motorists who drive too fast must pass many other cars, increasing their own hazard; motorists who drive too slowly cause other drivers to pass them too frequently, and often at the wrong time.

FOG AND SPEED

Low driving visibility leads to high driving fatalities. When the fog is dense, keep your speed low. Make sure that your life isn't lost in a fog.

Retirements *from* Service

James Gallagher

James Gallagher, Senior Bridge Engineer, retired from the Bridge Department of the Division of Highways on September 30, 1954, after 33 years of service.

Jim was born September 20, 1884, at Branch Hill, Ohio. He attended Cincinnati public schools and graduated in 1908 from the University of Cincinnati with a degree in civil engineering.

JAMES GALLAGHER

Upon graduation from the university, Jim worked on survey crews doing maintenance and construction work for the Pennsylvania and Big Four Railroads in Ohio and Indiana and was Assistant Engineer on tests and operations for the Municipal Water Works in Cincinnati. He was employed as estimator and assistant superintendent of construction with the Ferro-Concrete Construction Co. of Cincinnati. He moved to the West Coast and worked for private engineering firms in Seattle, Washington, and then for several years was a structural engineer on railroad valuation in San Francisco.

Joins Highway Commission

In 1921, when the San Francisco office of the Interstate Commerce Commission was moved to Washington, D.C., he elected to remain in California and joined the California Highway Commission as a junior structural engineer in bridge design. At that time, a handful of designers, occupying one room in the Forum Building, turned out plans for all bridges built on the State Highway System. He designed some of the first bridges constructed in 1924 under the

. . . Continued on page 62

Helen R. MacLachlan

On October 1, 1954, Mrs. Helen R. MacLachlan, Personnel Officer for the Division of Highways, retired after completing over 21 years of state service, the last 18 of which were in the Division of Highways. A dinner in honor of Mrs. MacLachlan was held on October 5th at the University Club in Sacramento.

HELEN R. MacLACHLAN

Helen was born near Portland, Oregon, and received her schooling in in that city. Starting to work at an early age, her first positions were in the clerical field and included billing and mimeographing for various employers in the Portland area.

In 1918 she went to work as a junior stenographer for the U. S. Bureau of Public Roads Office in Portland. Transferred to the San Francisco regional office of the bureau, she worked up through various grades until, at the time of her resignation in 1932, she was a principal clerk, and served as secretary to the late Dr. L. I. Hewes, long-time regional chief.

While working for the bureau in San Francisco, a highway economist in the organization convinced Helen, whose last name then was Roork, that she should take on the name of MacLachlan. This union of the Irish and Scotch was accomplished on July 14, 1924.

After moving to Sacramento, Mrs. MacLachlan worked for the State Board of Equalization for three years and then transferred to the Division of Highways on January 4, 1937. Since July of that year, Helen has been personnel officer for the Division of Highways. During that period the

. . . Continued on page 63

Archibald M. Walsh

Archibald M. Walsh, senior high way engineer in District IV, retire September 1st after 29 years of serv ice in the Division of Highways, dur ing which he supervised many notabl construction projects.

Retirement plan call for Walsh an his wife, Genev to leave their Sa Francisco residenc for a small ranc near Sonora, wher Arch, as he i known to his man friends, plans t catch up on a nun ber of postponed hunting and fishin trips.

ARCHIBALD M. WALSH

Born in 1890 in Sausalito, Wals received his education in the north west, attending high schools in Ore gon and Washington and the Univer sity of Washington.

His first position in his engineerin career was on a survey crew with th Southern Pacific Railroad, after whic he worked with the Oregon Stat Highway Department for six year In 1924 he moved to California an was employed by the City of Sacra mento on inspection of street work

Enters State Service

In August, 1925, Arch Wals began his state service as an instru mentman in District IV. He worke on a variety of construction and loca tion projects for his first five yea with the State, then, in 1930, was as signed as resident engineer on a pro ect in Santa Cruz County in th vicinity of Boulder Creek. For th next 20 years he continued to serv as resident engineer on many impor tant highway projects in District IV

These projects included a numbe of sections of the relocation of Stat

. . . Continued on page (

George G. Pomeroy

George G. Pomeroy, Supervisor of ıe Machine and Instrument Shop of ıe Highways Material and Research)epartment, retired on August 13th, ompleting to the day 32 years of ervice with the State.

GEORGE G. POMEROY

Pomeroy came to work for the Division of Highways in 1922 in the Equipment Department. With the expansion of the Materials and Research Department, he was assigned to construct nany of the new items of equipment eeded and in January, 1930, was laced in charge of the first Laboraory Instrument and Repair Shop.

Since that time Pomeroy has vorked in close cooperation with the ngineers of the laboratory and of the livision as a whole on the developnent of hundreds of new ideas.

One of the early pieces of apparaus constructed by Pomeroy was a opy of the Florida bearing machine, load penetration device similar to he California Bearing Ratio but deigned for asphaltic mixtures.

Created Many Machines

Other instruments and machines vhich he created and developed inlude beam breaking machines, bump neters, automatic air pumps for samling contaminated atmosphere along ighways, stabilometers, soil compresion machines and fatigue testers.

A partial list of the numerous mahines, instruments and devices creted or improved by Pomeroy durng the past 24 years, which was read t the retirement dinner held in his ıonor on August 12th at Manhart Hall, contained 62 items.

Pomeroy was born in Edgerton, Visconsin, in 1884, and received his ducation in mechanical engineering t the University of Wisconsin.

Prior to coming to work for the State, Pomeroy held many jobs as nechanic and machinist in private in-

. . . Continued on page 64

John W. McPartland

John W. McPartland, Assistant Hydraulic Engineer, Division of Water Resources, retired August 13, 1954, after 32 years of state service.

"Mac" was born on September 14, 1899, in San Francisco, where he attended grammar and high school. His education was interrupted, however, by World War I. During this war, "Mac" saw action in France and Germany. Following the end of hostilities, he continued his education and attended Heald's Engineering School in his native San Francisco for three years. During this period, he visited his sister at Franklin Hospital and as a result, relieved the staff of one of their prettiest nurses, Miss Emilia Fischie, whom he married in 1921.

JOHN W. McPARTLAND

In 1920 he joined the staff of the Sacramento County Surveyor as a draftsman, and later was with the Sacramento County Engineer's office.

In 1922, "Mac" entered state service as a draftsman with the State Highway Commission and in 1923 transferred to the Division of Water Rights, now known as the Division of Water Resources. His work throughout the years with the division was of a diversified nature. After some time as a draftsman, he was promoted to the watermaster service and saw duty throughout Northern California. Watermastering came easy to him and through his efforts he made many friends for himself and the State. In 1944 he left the watermaster service to work on the first of a series of special water resources investigations. In 1950 he joined the staff of the water quality function of the division where he worked until his retirement.

"Mac" is a member of Sacramento 40 Lodge, F. and A. M., Sacramento. Scottish rite and Ben Ali Shrine.

He and his wife plan to move near the fogbound coast in the vicinity of Carmel, where many of his fondest memories are realized.

Paul R. Watson

Paul R. Watson, Associate Highway Engineer, retired from the Bridge Department, Division of Highways, on August 31st.

Paul's retirement climaxed an active and varied engineering career which included work as private consultant and county construction engineer, as well as engineer with the Bridge Department.

PAUL R. WATSON

Although Paul feels like a native of California, the records show that he came west in 1886 from Boston, Massachusetts, his native city, at the age of two.

His early school days were spent in Santa Ana. He later moved to San Diego, where he was graduated from San Diego High School in 1903, and began his engineering career as assistant to a consulting engineer in that city. He left this position to enroll in the Civil Engineering Department of Stanford University.

Worked in San Diego

Immediately upon leaving Stanford, Paul was employed as acting bridge engineer for San Diego County, which position he held until 1920. During the flood of 1916, which caused so much damage in Southern California, he obtained much of his first-hand knowledge regarding the repair and construction of major bridges.

In recognition of his performance as Bridge Engineer, Paul was promoted, in 1920, to the position of Construction Engineer for the San Diego County Highway Commission under R. M. Morton, who was later to become the second California State Highway Engineer.

In 1922 the opportunities of private practice beckoned to Paul, and soon the firm of Watson, Valle and Gough was engaged in a successful engineering practice in and around San Diego.

. . . Continued on page 62

JAMES GALLAGHER

Continued from page 60 . . .

supervision of the newly organized Bridge Department.

The expansion of the department brought administrative duties and although there were no high sounding titles bestowed, Jim became, in fact, the first assistant to Bridge Engineer Harlan D. Miller. After Mr. Miller's death, for a time, he had the full responsibility for the department.

Administrative Assistant

Following the appointment of Charles E. Andrew as Bridge Engineer, Jim resumed his duties as Administrative Assistant. This included the negotiation and preparation of agreements concerning railroad grade separations, navigation clearances, etc., which then could be taken in stride with his other duties. However, starting with the WPA Grade Separation Program in the middle 1930's, the expansion of the highway program including the large amount of freeway construction in metropolitan areas, made the handling of agreements one of the most important tasks handled by the department.

For many years, Jim has had the responsibility of working out the complex federal, state, local and railroad relationships in the improvement and elimination of critical California railroad-highway grade crossings. He is a recognized authority and consultant in this field.

Jim's specialized knowledge and his ability to command the friendship and respect of all with whom he had dealings has been an asset to the department, the loss of which will be felt long after his retirement.

After his retirement he will continue to reside with his wife, Gertrude and daughter Patricia at 1311 38th Street, Sacramento. He also has another daughter, Mrs. Harry Tarbell of Bellevue, Washington, and four grandchildren, three boys and a girl.

WORST TIME OF DAY

Impatience to get home, weariness after the day's work and congestion of traffic make the hours from 4 to 6 o'clock p.m. the most dangerous of the day. More than a sixth of all traffic fatalities occur in those two hours.

PAUL R. WATSON

Continued from page 61 . . .

During this period Paul supervised the engineering work for a subdivision being developed by the real estate firm of Davis and Baker of Pasadena —Harrison Baker who later became a State Highway Commissioner.

Although most of his private practice was in the field of municipal engineering, Paul found time to design the two bridges on Mission Bay in San Diego, on the road from Crown Point to the Marine Base.

Enters State Service

Another notable structure which Paul designed is the multiple arch bridge across the San Luis Rey River near Bonsall. Because of the proximity of the San Luis Rey Mission, the lines of the bridge were made to conform with the architecture of the old mission, which resulted in a very pleasing and beautiful structure.

It was in the early thirties that considerable expansion occurred in the State's highway and bridge building program. It was in 1933 that Paul became associated with the Bridge Department. Since that time he has represented the department on the planning and construction of many of the major structures in the Los Angeles area. His work as Resident Engineer included such structures as the Santa Monica Tunnel, both of the Arroyo Seco Freeway bridges over the Los Angeles River, the Fair Oaks Bridge in South Pasadena, and the Sunset Boulevard-Glendale Boulevard separation structure.

In Planning Section

With the tremendous increase in freeway construction in Southern California, Paul joined the planning section of the Los Angeles Office of the Bridge Department where his background of design and construction could be brought to bear on the problems of the expanding freeway program. This position he held until his retirement.

A characteristic of Paul has been his willingness to impart to others with less experience the fruits of his extensive knowledge and experience. His advice has been solicited and highly valued by his associates.

He is a life member of the American Society of Civil Engineers, having joined the organization in 1917. He has been a full member since 1927.

The Watsons have two sons, Millard L. Watson of South Pasadena, and Paul R. Watson, Jr., of Sacramento, who is Assistant Construction Engineer for the State Division of Highways.

Paul says that the most important event of his career was his marriage on February 2, 1911, to Alys E. Bullock. The Watsons live at 1535 Ramona Avenue in South Pasadena.

Les Bertken

On August 23, 1954, Les Bertken, Assistant Location Engineer, began a period of vacation prior to his official retirement from state service after nearly 36 years on October 1, 1954.

He started with the Division of Highways, District VI, in December of 1918 on construction and survey assignments, and in 1926, after brief service in District VIII, transferred to District IV, where he has been continuously employed.

Bertken was appointed chief of party shortly after his arrival in the district, and his entire service has been devoted to location surveys. There isn't a route, path or byway in the district that Les is not familiar with. He was in on the solution of most of the tough location problems in the district. The location of Route 5 in Santa Cruz County from Los Gatos to Scotts Valley particularly stands out in his recollection, where, due to the heavy brush and broken terrain, the going was extremely difficult.

Les is retiring near the minimum age limit, and is looking forward to operating a gold mine in his home County of Mariposa. He has plenty of youth and energy for this purpose and his many friends wish him much happiness and success in his new venture.

ALLING PAUL BUNYAN

ntinued from page 41 . . .

hough time had been available, it ould have been possible to burn the aterial but this process is very un-conomical so the contractor negoti-ed for disposal sites from property wners along the right of way and auled, dragged, or pushed the logs, umps, humus, etc., to these sites. hese disposal areas are situated so as) be well screened from the traveled ay by the dense growth of trees and rush. Some merchantable trees and gs have been obtained from the learing operation and these have a eady market in this area where lum-ering is a major industry.

The larger portion of the grading on is project involved the use of 515,000 ons of imported borrow to construct em-ankments. The remainder of the con-truction involved the use of 127,000 cubic ards of roadway excavation, a major ortion of which was involved in the level-ng of a small rocky knoll near the line for se as local borrow. Also included in this em was approximately 14,000 cubic ards of excavation for the removal of nsuitable material from six swamp areas vhich are crossed by the new alignment. hese swamps were from two to six feet leep and were backfilled with river ravel.

Due to late rains this past spring and early summer and to the poor drainage of the terrain through which the alignment passes, many areas of muddy, unstable ground were en-countered. In order to obtain a stable roadbed, it was necessary to strip this unsuitable material, which varied in depth from one to three feet, prior to starting embankment construction.

Frontage Roads and Structures

In order to reduce access to a mini-mum, several small frontage roads were constructed, the major one being approximately one-half mile in length along the south side of US 199 at the new intersection with US 101. This latter road serves farm property, a subdivision, and a motel. Its effect on the growth of this area will be watched with interest as it is the first frontage road constructed in Del Norte County.

In addition to the two cattlepasses previously mentioned, five reinforced concrete box culverts were con-structed on the new section of align-ment. Reinforced concrete pipe cul-verts were used at other locations throughout the job.

The total contract allotment is $846,190.44. Floyd O. Helm is Super-intendent for the McCammon-Wun-derlich Company, B. D. Van Zandt is Resident Engineer for the State, and Alton Kay represents the Bridge De-partment for the concrete structures.

ARCHIBALD M. WALSH

Continued from page 60 . . .

Sign Route 17 between Los Gatos and Santa Cruz, the freeway construction on Sign Route 1 between Santa Cruz and Watsonville and the construction of the Half Moon Bay Flight Strip during World War II. In 1950 Walsh was promoted to senior highway engi-neer and was assigned as field super-visor on construction contracts in the southern portion of the district.

In retirement Arch Walsh leaves many younger engineers to carry on highway work with the benefit of the sound training he imparted.

HELEN MacLACHLAN

Continued from page 60 . . .

total number of employees in the Di-vision of Highways has increased from about 6,200 to just over 10,000.

Now that she is retired, Helen plans to devote some of her time to charity work and expects to be kept busy the rest of the time with house and gar-den work at the family home in Sac-ramento.

Looking south from the north end of project showing grading in progress on the only portion of alignment which was relatively clear of brush or trees. Clearing here involved only the removal of occasional stumps from approximately 3,000 feet of pasture land.

SAN FERNANDO PASS

Continued from page 37 . . .

opment of the historic pass into the San Joaquin Valley, where as early as the fall of 1865, oil drilling activities were already under way in what are now the McKittrick Oil Fields of Kern County.

Around the early 1870's, when dust became a menace due to the terrific amount of travel, the road through the cut was paved with black asphalt. Then, with the extension of the Southern Pacific Railroad line through Southern California in 1875, a tunnel was cut through the mountain, and a considerable amount of shipping was carried on by rail, thus relieving some of the pressure on the wagon road.

But with the turn of the century, pressure began building up again. Beale's Cut was no longer wide enough to accommodate the heavy flow of traffic; moreover, the road itself was too steep for the newfangled "gasoline buggies" that were chugging over the roads of Southern California in ever-increasing numbers.

Come 1910, the population of Los Angeles County had risen to 504,131; and there were some 44,132 automobiles registered in the State, many of which at one time or another were cluttering the narrow San Fernando-Fremont Pass Road through Beale's Cut. There was only one answer: Build a new road!

Action came swiftly, when that same year, Los Angeles County, through a bond issue, began the construction of the Newhall highway tunnel through the ridge of hills to the west of the old cut. Although the new tunnel had a bore of only 17 feet 5 inches, it provided two lanes for traffic, which was a marked improvement over the old, steep, one-way road.

For nearly three decades the famous tunnel—part of the State Highway System since 1916—accommodated the ever-increasing amount of traffic to and from the Los Angeles area. But by 1938, it was no longer adequate. At times an average of 3,000 cars per hour passed through the tunnel, with traffic blocked for a mile behind. To eliminate the critical bottleneck—the worst in Southern California—the State Division of Highways removed the old tunnel in 1939 to make way for a new four-lane divided expressway—the present Highway US 6.

Today, picturesquely silhouetted against the sky, within sight of the heavily traveled highway, the historic gateway through which the tide of empire once surged, stands deserted and alone; serving only to intrigue the passing motorist and to attest to the skill and perseverence of California's pioneer road builders.

EDITOR'S NOTE:

As a main source of information on San Fernando Pass, the author acknowledges:

Vernette Snyder Ripley: "The San Fernando Pass and the Pioneer Traffic That Went Over It." Quarterly, Historical Society of Southern California; March, 1947—Part I; September, 1947—Part II; March, 1948—Part III.

In Memoriam

SAMUEL M. TEMPLETON

District XI was saddened by the news of the passing of Samuel M. Templeton, June 16, 1954, at a local hospital after an illness of several months. Mr. Templeton, a highly regarded employee of the district, was born April 26, 1895, at Clarksville, Texas, and after graduation from high school attended Trinity University in Texas until 1915. After service during World War I, he began his chosen career in engineering and served as instrument man, field inspector, estimator, and field office manager with private concerns and municipal agencies prior to his employment by the Division of Highways.

On August 4, 1930, Templeton accepted employment with the Division of Highways as a junior civil engineer in District VIII under E. Q. Sullivan, who was then district engineer in District VIII. Shortly thereafter he joined the newly formed District XI and transferred to San Diego as an assistant resident engineer on October 9, 1933.

During his tenure in District XI, Templeton served as a field construction inspector on many of the quickly developing highway projects. At the time of his passing Templeton was an assistant highway engineer.

Those surviving him include three sons, Samuel M., III, William W., and David, and a daughter, Mrs. Charles Graham, all of San Diego.

In Memoriam

JOHN W. CORVIN

John W. "Jack" Corvin, Assistant District Engineer of District V, Division of Highways, died in San Luis Obispo on September 18, 1954, after a long period of illness. He had been an employee of the California Division of Highways since graduation from the University of Nevada in 1928.

Born in Green River, Wyoming, January 25, 1905, Corvin came to California as a child and was educated in Roseville.

His first job with the Division of Highways was as a chainman and rodman for District III on the Emerald Bay, Lake Tahoe, construction project. He continued to work on surveys, as resident engineer on all types of paving jobs, and later served as District Materials Engineer and District Location Engineer.

During World War II Corvin was assigned to location and construction of emergency flight strips, and for one year was sent at the request of the Federal Government to serve as field engineer on highway, railroad and army camp construction in Iran.

After World War II Corvin served for a brief period in District II, Redding, and then returned to Headquarters Office in Sacramento, serving in an administrative capacity and as Assistant Traffic Engineer. He was assigned to District V in 1950 as Assistant District Engineer, with jurisdiction over various district functions including traffic, materials, right of way and administration.

Corvin is survived by his widow, Dorothy, and daughter, Amelia Mary, in San Luis Obispo; and by two sisters, living in Roseville.

GEORGE G. POMEROY

Continued from page 61 . . .

dustry including the embryonic automobile industry, and later with the Santa Fe and Western Pacific Railroads.

Pomeroy and his wife live at 4810 Eighth Avenue in Sacramento. He expects to spend much of his time after retirement pursuing his hobbies of rock collecting and photography.

GOODWIN J. KNIGHT

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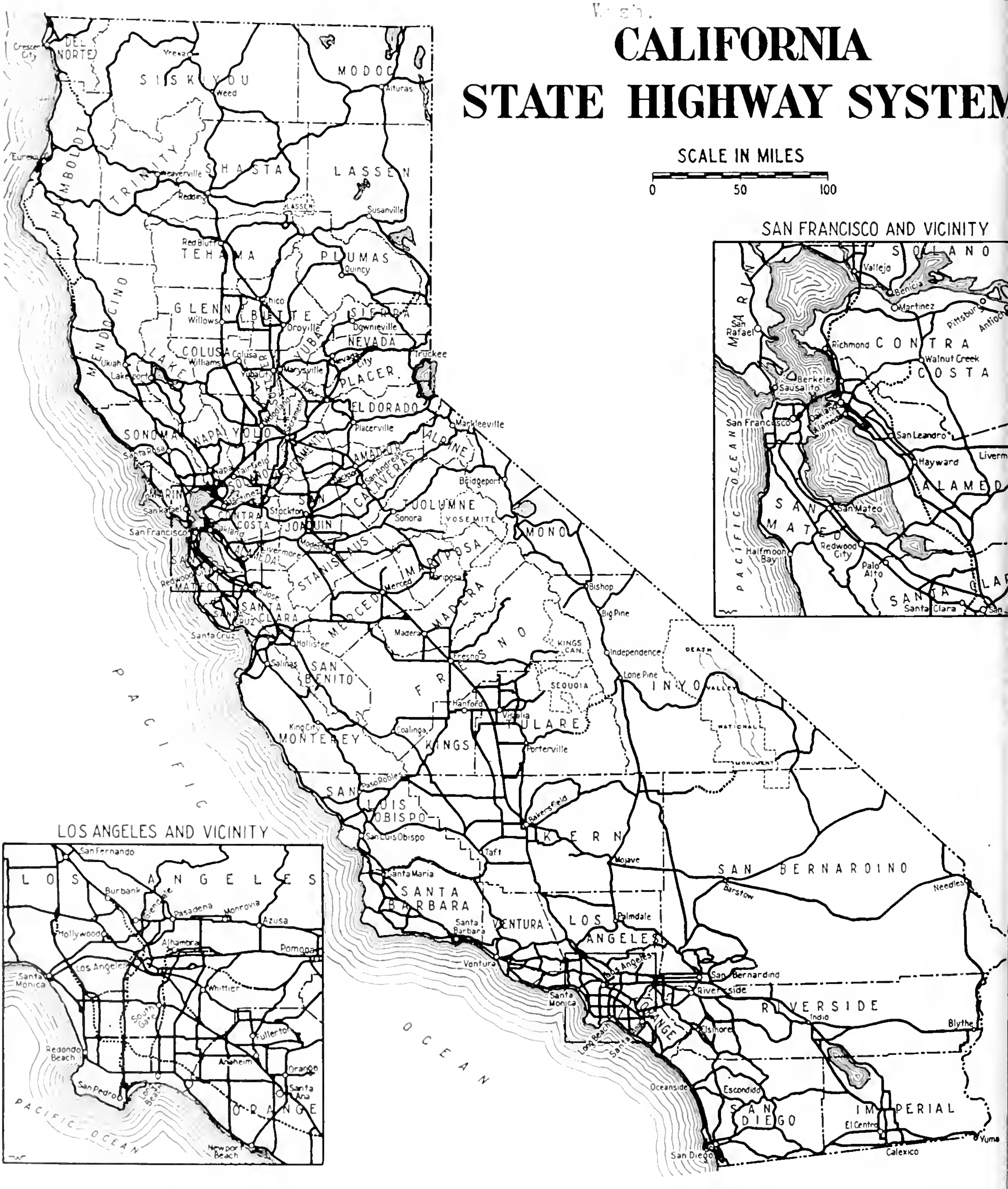

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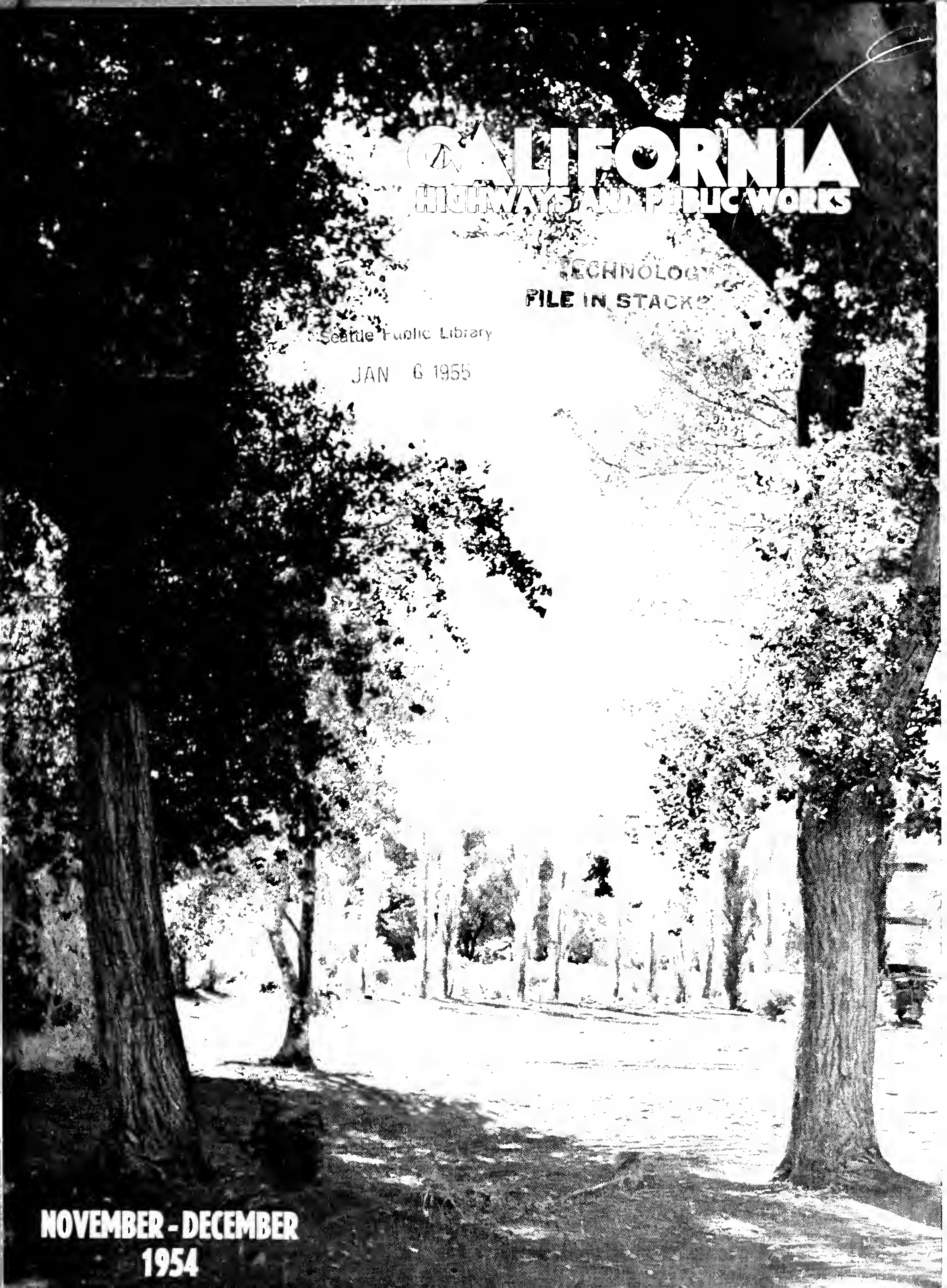

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Financing of Grade Separations

What Can Be Done to Obviate Legal Delays

By JAMES GALLAGHER, Senior Bridge Engineer (Retired)

What can be done to eliminate or at least minimize the long legal delays which threaten to hold up important highway construction projects involving railroad grade separations?

The railroads and the road-building public agencies involved are bound to disagree over how much of the cost of the project each party should bear. Unfortunately, while the argument continues, an increasing volume of highway and railroad traffic is subjected to the delays and dangers of existing grade crossings.

In this article Mr. Gallagher reviews the history of this problem in California and other states and suggests a method of getting the separation built first and ironing out the financial dispute later.

Mr. Gallagher retired at the compulsory age of 70 on September 30, 1954, after 33 years of service in the Bridge Department of the Division of Highways. He is widely recognized as an authority on the complex problems of railroad-highway grade crossing elimination.—*Editor.*

When the railroads were first constructed in California, highways were few and far between. The railroads, at their own expense, constructed crossings at grade or at separated grades, depending on the topography. At this time, grade separations were few and usually occurred only when made necessary by the topography.

With the development of the motor vehicle, highways assumed a constantly increasing importance in the national economy. California, in particular, became a "state on rubber-tired wheels," its motor vehicle registration growing from 36,000 in 1909 to about 6,000,000 in 1954. Since 1927 highway construction in general has been financed from various special taxes paid by these increasing numbers of highway users, plus some federal aid. The annual expenditure for major highway construction purposes in California now approximates $200,000,000 per year.

Separations Necessary

"Stop, Look and Listen" was the standard warning in the old days to the occasional slow-moving highway vehicles approaching a grade crossing traversed by fast-moving trains. Nowadays highway traffic is neither occasional nor slow-moving, nor is the motoring public willing to "stop, look and listen" at every railroad crossing. The safe and expeditious movement of both railroad and highway traffic demands that major points of conflict be resolved by separation structures.

Such structures are expensive. Who should bear their cost, and to what proportionate extent? The importance of a practical solution to the problem grows in proportion to the rapidly expanding population and economy of this State.

Early Decisions

The problem is by no means new. The Public Utilities Commission of the State of California was organized in 1911 (under the name of the California Railroad Commission). Its powers and duties were defined in the Public Utilities Act of 1915. Among the powers delegated to the commission was:

"* * * exclusive power to determine and prescribe the manner, including particular point of crossing and the terms of installation, operation, maintenance, and use of railroad-highway crossings."

Thus, even in 1915 the need was apparent for a body to adjudicate conflicting interests of railroads and highways at crossings.

Over the course of the next 18 years the problem proved not too difficult of solution. Financial limitations kept the volume and standards of highway construction at a relatively low level, and there were not very many crossings where highway traffic was heavy enough to make a separation structure urgent. Nor, at that time, did the railroads regard highway transportation as a seriously competing industry.

During that 18-year period the commission apportioned to the railroads a varying proportion of the cost of highway-railroad separations, depending on the particular circumstances of each case. But it did hold consistently that the railroads do constitute a barrier to the interchange of traffic, whether it be a horse-drawn cart or the speedy horseless carriage of today and that railroads do have a continuing obligation to provide, or to participate in the cost of providing, safe and convenient means of crossings of their tracks.

In general, prior to 1933, the commission apportioned to the railroad involved 50 percent of the cost of a highway-railroad grade separation which eliminated an existing grade crossing; and 25 percent or less where an existing separation was reconstructed or where the new separation was on new alignment which did not eliminate an existing grade crossing.

As the volume and speed of vehicular traffic continued to rise and with them the standards of highway construction, there came a marked increase in the number and the over-all cost of grade separations. Also, the railroads began to contend that the improvement of major cross-country highways had reached the point where they were being increasingly used by long-haul motor trucks. If required to contribute to the cost of a grade separation in excess of railroad benefit the railroads argued, they were in effect being forced to contribute to the construction of a roadway for the use of a competitor.

The commission took cognizance of this argument in its 1933 Decision No. 25551 for construction of the Plaza Garage Underpass in Tulare County. This was a grade separation which eliminated an existing grade crossing on US 99. The decision required the Southern Pacific Company to contribute $15,000 towards the construction of this grade separation costing $66,700 exclusive of paving, or about 22 percent of cost, as compared with 50 percent apportioned by previous commission decisions in similar cases. It is to be noted that this decision was rendered at the depth of a financial depression, when the earning capacity of business was very low.

Federal Aid Truce

The next decade or so was a period of uneasy truce, with the inevitable showdown deferred as a result of the Federal Emergency Relief Act of 1935. That act provided Federal Works Progress funds for complete financing of the elimination of hazards at railroad-highway grade crossings, including construction of grade separations as well as installation of automatic crossing protection devices.

Approximately $17,000,000 was allotted to California for these purposes under 1935 and subsequent federal appropriations up to 1944 and a total of 101 grade separations were built in this State with federal funds. These grade separations involved no cost to the railroads, except that they were reimbursed on the basis of direct out-of-pocket costs for work done by railroad forces, with no allowance for overhead and similar items.

Actually, it was 1949 before the Public Utilities Commission issued another decision which adjudicated the cost of a grade separation between the railroad and the public. The railroad grade separations on the state highways constructed during this period were practically all financed with federal grade crossing funds, apportioned under the 1935 and subsequent acts or with federal funds under the 1944 Federal Aid Highway Act. A few separations on new highway alignment, which did not close any existing grade crossing, were financed wholly with state funds by agreement.

Benefit Principle

The Federal Aid Highway Act of 1944 introduced a new element. The act provided that for construction of a highway-railway grade separation, the railroad involved is liable for the amount of the railroad benefit but not to exceed 10 percent of the cost. In passing the 1944 Highway Act, Congress recognized that the railroads have an obligation to contribute to the cost of grade separations, but limited the railroad's obligation to 10 percent as maximum railroad benefit, possibly to protect the railroads from too heavy a financial burden incident to the construction of numerous grade separations as part of accelerated highway programs throughout the Nation.

What constitutes railroad benefit? For three years after the passage of the 1944 Federal Highway Act, the State of California and the railroads were unable to reach a satisfactory agreement on this point. The railroads placed a very small valuation on the intangible benefit accruing to them from a grade separation. They computed it either on the basis of average annual out-of-pocket costs at the crossing in question for claims, legal expenses, repair of damage, and grade crossing maintenance, or on the total amount paid by the railroad because of crossing accidents on its California trackage, divided by the total number of its grade crossings. On the latter basis, one railroad figured its annual savings by elimination of hazards at an average grade crossing at less than $200.

Other states faced the same problem of establishing railroad benefit, with the consequent stoppage of construction of grade separations und[er] the 1944 act. A definition of railro[ad] benefit was needed. It was provid[ed] by joint committee action of t[he] American Association of Highw[ay] Officials and the Association of Ame[r]ican Railroads, and was set forth [in] General Administrative Memorandu[m] No. 325 of the U. S. Bureau of Publ[ic] Roads, dated August 26, 1948.

This memorandum provides in e[f]fect that if the existing grade crossi[ng] which the separation is designed [to] eliminate is closed, the railroad bene[fit] and railroad contribution is 10 pe[r]cent; if this principal grade crossi[ng] is not closed, the project is consider[ed] of no benefit to the railroad and ther[e]fore no railroad contribution is r[e]quired.

In California both the State and t[he] railroads have accepted G. A. M. N[o.] 325 as a basis for figuring railroad co[n]tribution to the cost of grade separ[a]tions financed in whole or in part wi[th] federal funds; and since 1948, Califo[r]nia has had very little difficulty [in] reaching satisfactory agreements wi[th] the railroads for construction of grad[e] separations on federal aid projects.

In the case of totally new crossing[s] G. A. M. No. 325 considers a ne[w] highway crossing of the railroad [as] being of no benefit to the railro[ad] and therefore requiring no railro[ad] contribution; while a new railro[ad] crossing of an existing highway is co[n]sidered wholly for the railroad benefit and should be financed 1[00] percent by the railroad. This appo[r]tionment has been followed in Ca[li]fornia not only on federal aid pro[j]ects but also on those financed wi[th] state or railroad funds alone.

The total cost of a highway-railro[ad] grade separation for the purpose [of] determining railroad benefit and li[a]bility under the 1944 Highway Ac[t] is specified in G. A. M. No. 325 [as] the cost of that portion of an improv[e]ment which will accomplish redu[c]tion or elimination of railroad cros[s]ing hazard including cost of constru[c]tion engineering and right of wa[y]. This includes cost of underpass [or] overhead structure, necessary high[]way approach and rail approach thereto, railroad shoofly, highway de[]tour and all work necessary to effe[ct]

At the Los Feliz Road grade crossing (Glendale-Los Angeles city line) heavy traffic backs up behind the gates while one of numerous daily trains passes

the separation. In California we have used the definition as given in G. A. M. No. 325 for the last several years and have had very little difficulty in reaching agreements with the railroads as to what items should be included.

Washington Boulevard Case

The issue regarding apportionment of cost for improvement or replacement of existing grade crossings not involving federal aid, was brought to life sharply by a Public Utilities Commission decision in 1949 in the case of a proposed widening of the Washington Boulevard underpasses of the Santa Fe tracks in the City of Los Angeles.

The case originated in 1932, when the commission had apportioned 25 percent of the cost of the widening to the railroad and 75 percent to the city, but the project was deferred by the city, and was revived in 1949.

The commission's 1949 decision apportioned to the railroad not 25 percent, but 50 percent of the cost of widening the underpasses from the existing 24 feet to 56 feet, the width of the adjacent street sections. Neither party was satisfied. The railroad contended the widening was of no benefit to the railroad and the city contended the railroad should pay the total additional cost due to presence of railroad, for widening of the underpasses to 96 feet, the planned ultimate width of that part of Washington Boulevard. Both sides asked for a rehearing.

In June, 1952, the commission issued its Decision No. 47344, apportioning to the Santa Fe 50 percent of the estimated $569,000 cost due to presence of railroad of widening the underpasses to 96 feet.

Commission's Decision

The commission's Decision No. 47344 covering the rehearing, states:

"There is no statutory requirement that this commission follow any particular theory of allocation of costs. Under the theory advanced by the City of Los Angeles that the railroad should pay the additional costs of construction resulting from the presence of the tracks, the railroad's share would amount to about 86 percent of the total costs. Under the theory advanced by the railroad that it should pay only according to the benefits it receives, and considering its contention that it receives no benefits, its contribution would be nothing.

"The authority of this commission to allocate costs, as designated in Section 1202 of the Public Utilities Code, supra, is an exercise of the police power on the part of the State of California through the medium of its agency, the Public Utilities Commission. We hold that the law is well established that under the exercise of the police power a state may regulate the crossings of railroad with its highways, and may require grade separations to be erected and maintained, apportioning the costs in the exercise of its sound discretion."

Los Feliz Case

At about the same time the commission issued its Decision No. 47420, concerning the Los Feliz Road crossing of the tracks of the Southern Pacific. In this case it apportioned the total estimated $1,493,200 cost of a grade separation as follows: 50 percent to be borne by the Southern Pacific Company, 25 percent by the County of Los Angeles, 12½ percent by the City of Glendale and 12½ percent by the City of Los Angeles.

The railroad's contention was that its contribution should not exceed $118,340, computed on the basis of its net annual monetary savings by the closing of the grade crossings, capitalized at 5 percent. The City of Glendale, on the other hand, maintained that the railroad should bear the entire cost of the separation, since in the absence of the railroad the present street would be adequate and no grade separation necessary. The commission's decision in this case reaffirmed its position as outlined in the Washington Boulevard decision.

Both decisions were appealed by the respective railroads to the Supreme Court of California. When the state court denied the appeals, they were taken to the United States Supreme Court. The railroads contended that in the allocation of costs the orders of the commission take railroad property without due process of law, are so arbitrary and burdensome as to constitute an interference with interstate commerce, and that costs should be distributed on the basis of benefits.

Supreme Court Decision

The United States Supreme Court, in its decision of November 9, 1953, upheld the orders of the Public Utilities Commission. This settled the Washington Boulevard and Los Feliz cases but did not provide a permanent solution to the problem. On the contrary, it practically insures the fact that railroad-highway grade separations (unless they are on a federal aid construction program) will not be constructed without prolonged and costly hearings, with each case being fought out individually.

The U. S. Supreme Court decision dealt primarily with the question of whether the allocation of the reasonable cost of grade separation improvements by the P. U. C. was arbitrary unless it was based on the benefits received, as contended by the railroads.

The court drew a distinction between benefits in the ordinary sense, which serve to enhance the value of the property involved, and the improvements expected to result from the grade separation project. The decision said in part:

"Rather, in the cases at bar, the improvements were instituted by the State or its subdivisions to meet local transportation needs and further safety and convenience, made necessary by the rapid growth of the communities. In such circumstances, this Court has consistently held that in the exercise of the police power, the cost of such improvements *may be* allocated all to the railroads. There is the proper limitation that such allocation of costs must be fair and reasonable. *Nashville, C. & St. L. R. Co.* v. *Walters*, 294 U. S. 405, 415, and the cases there cited. This was the standard applied by the Commission. It was not an arbitrary exercise of power by the Commission to refuse to allocate costs on the basis of benefits alone. The railroad tracks are in the streets not as a matter of right but by permission from the State or its subdivisions. The presence of these tracks in the streets creates the burden of constructing grade separations in the interest of public safety and convenience.

Cars pile up behind a grade crossing on State Highway Route 162 (Fletcher Drive) in Los Angeles

Having brought about the problem, the railroads are in no position to complain because their share in the cost of alleviating it is not based solely on the special benefits accruing to them from the improvements."

Nashville Case

The court went on to state that in the *Nashville* case relied on by the railroads, in the first place the grade separation was on a state highway system rather than serving a local community, thus bringing in the factor of long-haul competition; and in the second place, the fixing of the railroad's share of the cost at 50 percent could be considered arbitrary and unreasonable. In that case the 50 percent was fixed by statute, with no consideration of the special facts of the case involved.

The California commission, on the other hand, considered all the evidence offered, the decision continues, "and properly applied the rule of allocation sanctioned by this court. There is no showing on these records of arbitrariness or unreasonableness in the commission's orders, and none is claimed except as the commission refused to allocate costs on the basis of benefits received, which we hold it was not required to do.

"Certainly, if the commission has the right to order these improvements and has not, in allocating the costs, acted so arbitrarily as to deprive the railroads of their property without due process of law, the fact that the improvements may interfere with interstate commerce is incidental. The construction and use of public streets is a matter peculiarly of local concern and great leeway is allowed local authorities where there is no conflicting federal regulation, even though interstate commerce be subject to material interference.

"When the appellants went on the streets in question, they assumed the burden of sharing on a fair and reasonable basis the costs of any changes for the reason of public safety and convenience made necessary by the growth of the communities.

"The orders of the commission are not arbitrary or unreasonable and do not deprive the appellants of their property without due process of law, nor do they interfere unreasonably with interstate commerce."

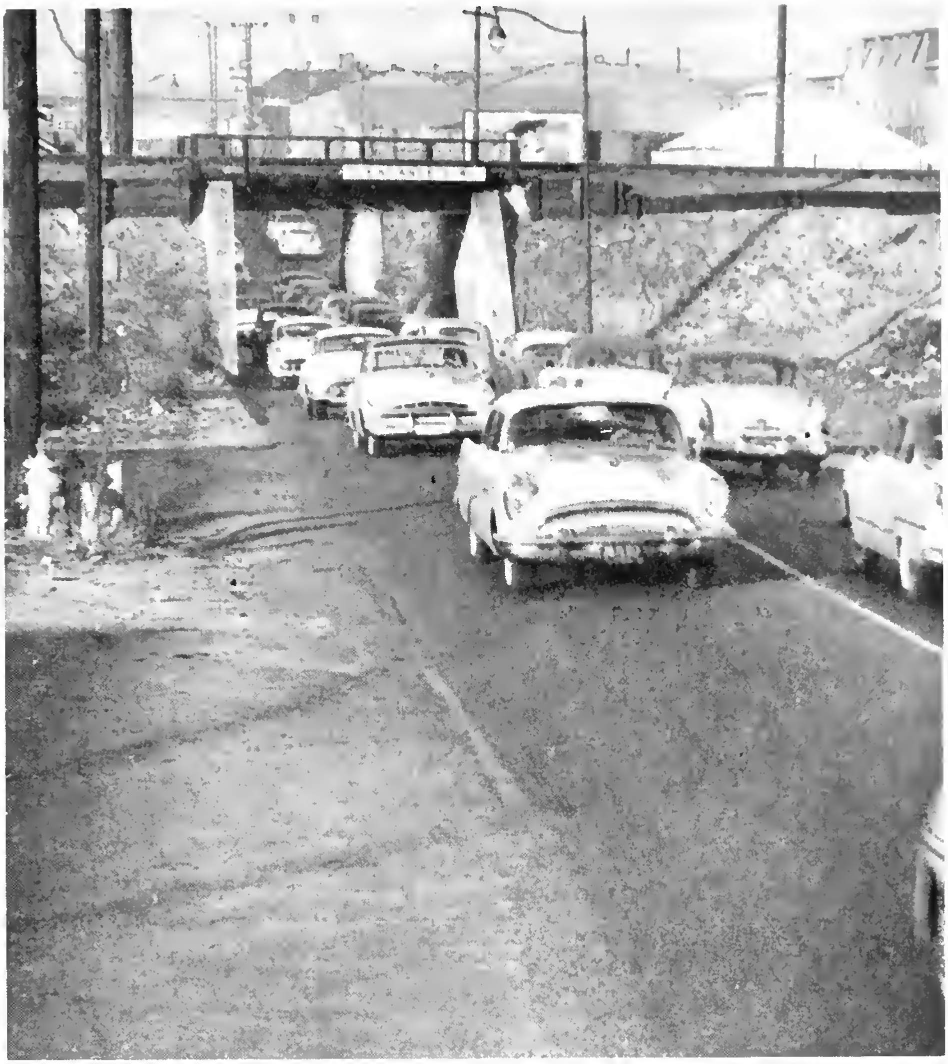
Effect of Decisions

While the Supreme Court decisions represent a clear-cut solution to the Washington Boulevard and Los Feliz situations, they may have the result of requiring the Public Utilities Commission to apportion costs for all similar separations proposed for state highways and other streets and roads in California unless they are on the federal aid construction program.

Other States

A report put out by the Association of American Railroads in 1950 based on questionnaires sent to states throughout the Union, shows that in 18 states the apportionment of cost between the railroad and the public is by a commission, 19 states have legislation requiring the railroads to contribute 50 percent or more, and six states require railroads to contribute 10 to 25 percent. In five states, railroad contribution is based on benefits not to exceed 10 or 15 percent of the cost. Six of the states differentiate between local highways and through highways. The laws of several states require railroads to contribute to the cost of new grade separations on new highway alignment.

In 1951 the Tax Research Association of Houston, Texas, submitted a questionnaire to all of the states and the District of Columbia regarding the financing of grade separations. The results of this questionnaire were published in a report March 1, 1952. The Texas report includes tabulations showing number of grade separations built from 1939 to 1950 inclusive, in each of various states, the total cost of said separations and the source of funds. Six states are not included in the tabulation because they did not answer the questionnaire or did not include sufficient information.



Four lanes of Washington Boulevard traffic in Los Angeles funnels into this two-lane underpass

Texas Report

The Texas report shows clearly that in the 1939-1950 period the majority of states used federal funds for financing grade separations. Of the five states which have statutes requiring 50 percent railroad contribution, only one (Virginia) showed a railroad contribution of more than 10 percent. Two other states with statutes requiring railroads to contribute 15 percent showed a total of only 10.37 and 7.50 percent railroad contributions.

The New York Grade Crossing Elimination Act of 1939 provides that the cost of grade crossing elimination shall be paid initially by the state, with the amount of railroad contribution to be adjudicated later by the Public Service Commission and the state reimbursed to that extent.

Under this system New York reports a total of 196 grade separations constructed between 1939 and 1950, inclusive, at a total cost of $60,791,000, to which the railroads contributed $8,290,000, or 13.64 percent.

It is apparent from the Texas report that those state laws requiring a 50 percent railroad contribution are largely inoperative. (Also, as indicated in the Supreme Court decisions, a fixed percentage may be ruled by the courts as arbitrary.) Except for Virginia, the states which have obtained the largest contributions from the railroads have been those states with laws requiring a more moderate railroad share and those states where the apportionment of cost is determined by a commission.

Delay Problem

There is one serious defect, however, in the commission procedure as now practiced in California. The necessary time-consuming steps in arguments, hearings, reviews, briefs and appeals means that the construction of badly needed grade separation is not effected at the time they are needed. The delay extends into years where there is disagreement over apportionment of costs. The process is particularly slow when the railroads contest the basic principles on which apportionments are made. The City of Los Angeles made its application in the *Washington Boulevard* case in 1948; the U. S. Supreme Court decision was issued in November, 1953.

The railroads' position apparently is that they will not voluntarily assume any greater costs than they are legally required to do. This means that, in the absence of further action by the Legislature, elimination of existing grade crossings or widening of existing separations not involving federal aid must be delayed for a year or more after the filing of an application with the P. U. C. On nonfederal aid projects, California has been unable, except in a few isolated cases, to reach satisfactory agreement with railroads as to the amount of railroad contribution to crossing projects which involve elimination of a railroad grade crossing or reconstruction of an existing separation.

Actually, the cost to the public caused by the delay in the construction of a needed grade separation may be more than the amount of any anticipated railroad contribution. The prime responsibility of the highway builder is to provide safe and adequate roadways for vehicular traffic as rapidly as possible, and also as economically as possible so that the highway user gets full value for his tax dollar. This means, among other things, that the railroads should pay their proper share of the cost of a grade separation.

Conflict Over Benefits

The railroads have taken the position that their proper share is the amount of monetary benefit they would receive from the construction of the structure and the elimination of the grade crossing hazard. Since 1944 the railroads in California have endeavored to obtain passage by the State Legislature of a law directing the Public Utilities Commission to apportion the cost of grade separations on the basis of benefits. The *Washington Boulevard* and *Los Feliz* decisions, apportioning 50 percent of the costs to the railroads, will undoubtedly result in a particularly strong concerted effort in 1955 to obtain enactment of such a law, since these decisions indicate a trend toward higher apportionments to the railroads.

If a law involving benefits is to be effective in expediting negotiated agreements with the railroads, it should clearly define "benefit."

As indicated earlier, the railroads' interpretation of benefit to them is the capitalized value of the annual monetary savings or tangible benefits accruing to the railroads by reason of construction of a separation. By inference, they consider anything else to be for the benefit of vehicular traffic. They omit all costs and intangible benefits not appearing on their books. Thus, where a 24-hour crossing watchman and manual gates are eliminated by a grade separation, the capitalized value of annual savings accruing to the railroad might approximate 10 percent of the cost of the separation; but for a crossing protected by such devices as automatic flashing lights the monetary saving to the railroad will amount to only 1 or 2 percent of the cost of separating grades.

Railroads' Interpretation

The railroads' interpretation of a benefit does not include, for example, the often substantial cost of a temporary shoofly or trestle to carry rail traffic during construction of an underpass; nor does it include the benefit accruing to the railroad by elimination of interference from vehicular traffic.

The railroads' interpretation completely disregards the public's right to the use of a safe and convenient crossing of the tracks. The railroad's passengers and freight certainly have no superior and inalienable rights to the use of a crossing. The apportionment of 50 percent to the users of the highway and 50 percent to the users of the rails, which is specified in numerous past decisions of the California Public Utilities Commission and in legislation in various other states, is not unreasonable on the basis of mutual obligations for the elimination of conflict between rail and vehicular traffic at a grade crossing.

The railroads have often cited the great number of grade crossings in the United States, stating that a requirement to eliminate them all at railroad expense would bankrupt the railroads. As far as California is concerned, the current construction program (July, 1953, to January, 1955) includes 38 railroad-highway grade separation projects, 30 of which (21 new crossings are on new alignment and nine widenings are on federal aid projects) involve no railroad contribution. Of the remaining eight, seven separations will eliminate existing grade crossings and are being financed with federal aid with 10 percent railroad contribution. The other project is not on a federal aid route; it involves widening of an existing underpass, and proceedings to determine apportionment of the cost have been commenced with the Public Utilities Commission.

Railroad Contributions

The total railroad contribution, for the seven elimination projects in California under federal aid projects totals about $450,000. This does not indicate a serious drain on railroad finances for the elimination of existing grade crossings. As a matter of fact, the railroads are currently spending approximately $1,200,000 for constructing separations at new railroad crossings of existing state highways.

In the meantime, while debate over apportionment goes on, a method must be found to insure the prompt construction of urgently needed grade separations. The cost in terms of delay and danger is too great at many existing grade crossings to wait until a final judgment is issued by a court of last resort.

Railroads and highways are both essential to the national economy. In the

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New Freeway

Ramona-99 Project Through Pomona, Claremont, Ontario And Upland Now Completed

By GEORGE L. LAIRD, Bridge Construction Engineer, Southern Section; C. J. McCULLOUGH, Resident Engineer, District VII, and E. A. BANNISTER, Resident Engineer, District VIII

On November 16, 1954, that portion of the US 99-Ramona Freeway in Districts VII and VIII between San Dimas Avenue in Los Angeles County and Archibald Avenue in San Bernardino County was opened to public traffic. This 13.5 miles of freeway passes through the Cities of Pomona, Claremont, Upland, and Ontario. It is the longest single section of full freeway to be opened at one time in the State of California. It is rare indeed that two adjoining major construction contracts, in this case totaling some $9,000,000, progress to completion so that the opening to public traffic can be on the same day and at the same time.

This highway is one of the most important traffic arterials entering the Los Angeles metropolitan area. It is the most direct route connecting Los Angeles with Imperial Valley and roads leading to the eastern section of the United States. Its importance is shown by the fact that this state route was one of the first in the Los Angeles area to be declared a freeway by the State Highway Commission.

Seven Major Contracts

Although we have here the situation of a 13.5-mile length of freeway being in effect a single unit, it is interesting to note that there are 6.3 miles in Los Angeles County within the District VII area and 7.2 miles in San Bernardino County within the District VIII area and also that it took seven major construction contracts to carry this vital freeway link to completion. The completed construction provides a four-lane freeway with provision for ultimate expansion to six lanes by the addition of two lanes in the median area. The lanes of the traveled way consist of portland cement concrete pavement. Shoulders, auxiliary lanes and ramps are of plant-mix surfacing.

The interchanges in the Pomona-Claremont area are of several types with the diamond shape used predominately. These points of ingress and egress are located at important cross streets and are, in general, evenly spaced throughout the area. The braided connection with the existing traveled way near the westerly end of the project not only provides a convenient entrance to Pomona but also becomes the junction of two freeways. The westerly one mile of existing Route 26 becomes Route 77. The latter route has been declared a freeway from its junction with the Ramona Freeway to the San Bernardino county line. The Ramona Freeway also crosses State Route 19 which is

Looking southerly along San Antonio Avenue showing dual Romono Freeway bridges

Looking north along Park Avenue showing freeway bridge structure

Garey Avenue. This route, carrying approximately 10,000 vehicles per day is the most important north and south connection between Foothill Boulevard, State Route 9 and the City of Pomona.

Diamond Type Interchanges

The diamond type interchanges constructed in the Upland-Ontario area will permit traffic to move in the desired direction without circuity of travel. The anticipated volume of left-turn movements is relatively low and does not justify the high right of way costs that are involved in the construction of cloverleaf loops. At the easterly end of the project a direct connection to the old highway is provided, affording safe and convenient access from the east to the Ontario business section.

Steps are presently being taken to purchase six acres of vacant land in the northeast quadrant of the Route 26/192 interchange (Euclid Avenue) for the ultimate construction of a loop. It is anticipated that eventually the left turn traffic increase from south to west will become too heavy for efficient operation with the diamond-type interchange as constructed. Advance right of way protection funds will be used to purchase the necessary land to permit this construction when warranted by traffic.

Traffic Bottleneck

That portion of US Highway 99, where it passed through the business sections of Pomona and Ontario, had long been one of the chief bottlenecks for through traffic. On November 1, 1947, this portion of the state highway was declared a freeway by the Highway Commission, and the planning and design for routing the freeway northerly, away from the business districts, was started. The Highway Commission decided not to wait until funds were available to do all of the work at one time. Rather, in the interests of speeding up construction of this important section of the freeway through Pomona, Claremont, Upland, and Ontario, it was decided to let separate structure contracts ahead of the road contracts. Toward this end, the first contract for seven structures in the Los Angeles County was awarded on June 4, 1952, for bridges in the City of Pomona.

A contract in the amount of $1,206,625.30 was carried out by R. M. Price Co. as general contractor and O. A. Johnson as resident engineer for the Division of Highways. The following bridges were included in this contract:

1. Dudley Street Overcrossing consisted of a two-span reinforced concrete box girder type of bridge, 141 feet long. Cost $86,200.
2. White Ave. Undercrossing consisted of two parallel concrete box girder bridges, 107 feet long. Cost $112,500.
3. Park Ave. Undercrossing also consisted of parallel bridges and was 92 feet long. Cost $105,700.
4. Route 26/19 Separation consisted of parallel bridges over Garey Ave., McKinley St. and Orange Grove Ave. and was the longest bridge on this section of freeway being approximately 820 feet long. Cost $471,900.
5. Towne Ave. Undercrossing was a twin box girder bridge, 158 feet long. Cost $167,800.
6. San Antonio Ave. Undercrossing consisted of two parallel box girder bridges, 93 feet long. Cost $109,200.
7. Alexander Ave. Undercrossing also consisted of two parallel bridges and was 84 feet long. Cost $88,700.

IPPER: Looking easterly along Ramona Freeway showing finishing-up operations in progress. CENTER: View along completed Ramona Freeway looking westerly rom Ganesho Avenue Bridge showing Route 77/26 grade separation bridge and Kellogg Hills in background. LOWER: Looking westerly from Dudley Street Bridge showing completed Ramona Freeway with Ganesho Avenue Overcrossing in background.

UPPER: Looking easterly at east end of project showing Archibald Avenue in background. CENTER: Looking westerly along completed freeway showing Sixth Street Overcrossing Bridge in City of Ontario and Campus Avenue Bridge in background. LOWER: Looking easterly along freeway at San Bernardino Avenue.

In San Bernardino County

The second contract was awarded on June 20, 1952, for construction of eight US 99 freeway bridges in San Bernardino County between the Los Angeles county line and Euclid Avenue, and included the following structures:

1. Mills Ave. Undercrossing consisted of two parelell reinforced box girder bridges, each 77 feet long. Cost $69,000.
2. San Antonio Wash Bridge consisted of two parallel concrete slab bridges, each 107 feet long. Cost $116,200.
3. Monte Vista Ave. Undercrossing consisted of two parallel box girder bridges, each 65 feet long. Cost $90,100.
4. Central Ave. Undercrossing consisted of two concrete box girder bridges, each 106 feet long. Cost $113,700.
5. Benson Ave. Undercrossing consisted of two parallel box girder structures, each 70 feet long. Cost $76,000.
6. Mountain Ave. Undercrossing also consisted of two parallel box girder bridges, each 70 feet long. Cost $72,700.
7. San Antonio Ave. Overcrossing was a two-span box girder bridge, 111 feet long. Cost $48,700.
8. Route 192/26 Separation consisted of two parallel concrete box girder bridges, each 111 feet long. Cost $104,300.

This contract, in the amount of $746,708.20, was performed by Charles MacClosky Co. Homer J. Scott acted as resident engineer for the Division of Highways.

Third Contract

The third contract in the amount of $724,873.10, was awarded on July 11, 1952, to W. F. Maxwell for the construction between Euclid Avenue and Archibald Avenue in San Bernardino County of the following bridges:

1. Sultana Ave. Overcrossing, a reinforced concrete box girder bridge, 111 feet long. Cost $50,700.
2. Campus Ave. Overcrossing, also a box girder, 115 feet long. Cost $54,200.
3. Sixth St. Overcrossing, a two-span box girder type bridge, 217 feet long. Cost $110,600.
4. Grove Ave. Undercrossing consisted of two parallel, single-span box girder bridges, 86 feet long. Cost $105,400.
5. San Bernardino Ave. Undercrossing consisted of two parallel box girder bridges, 100 feet long. Cost $151,-800.
6. Vineyard Ave. Overcrossing, a two-span concrete bridge, 114 feet long. Cost $67,700.
7. Cucamonga Wash Bridges consisted of two parallel concrete bridges, 97 feet long. Cost $56,700.
8. A St. Off-ramp Undercrossing was a concrete box girder bridge, 94 feet long. Cost $72,400.

Homer J. Scott also acted as resident engineer on this contract.

Fourth Contract

The fourth contract to be advertised was for the remaining construction to complete the 7.2 miles of US 99 freeway in District VIII from the Los Angeles-San Bernardino county line to Archibald Avenue east of Ontario. The contract was awarded to a joint venture consisting of J. A. Payton, Clyde W. Wood & Sons, Inc., and Geo. Herz & Co. on April 1, 1953. The contract allotment was $2,465,-387. The resident engineer on this job was E. A. Bannister.

The entire length of the project was constructed on new location as a four-lane freeway with provision for ultimate expansion to six lanes by the addition of two lanes in the median area.

Something of the magnitude of the project can be seen by reviewing a few of the major items of work. One million one hundred fifty thousand cubic yards of roadway excavation were moved, involving 85,000,000 station yards overhaul to reach its final location. Even this tremendous volume was not enough, and 210,000 cubic yards of imported borrow were necessary to complete the roadway embankment. Reinforced concrete pipe, ranging in diameter from 12 to 48 inches, was installed for a total length of 17,000 feet. Forty-five thousand cubic yards of portland cement concrete were poured in the pavement, and 27,000 tons of plant-

Looking easterly along Ramona Freeway showing Ganesha Avenue Overcrossing Bridge and westbound inlet ramp. Ganesha Park in background.

mixed surfacing were used for shoulders, auxiliary lanes, and ramps.

Depressed Section

Through the Upland-Ontario area, the freeway was constructed as a depressed section for a distance of two miles.

To take care of the drainage in the depressed section, a storm drain of reinforced concrete pipe, 9,500 feet in length, was installed in the median area, draining by gravity flow into Cucamonga Wash. The storm drain pipe ranged in size from 24-inch to 48-inch diameter. Side drain laterals of 15-inch diameter were connected to the storm drain at 300-foot intervals to take care of surface drainage.

The Metropolitan Water District aqueduct, carrying water from the Colorado River, crosses the freeway at two locations. One crossing is near the westerly end of the project at Ramona Street, and the other crossing is in the vicinity of Sixth Street in Ontario. The aqueduct is a 12-foot 8-inch inside diameter concrete pipe. These crossings were protected by means of reinforced concrete bridges that will enable access to the aqueduct at all times.

The roadway excavation was accomplished by means of one four-cubic-yard dragline and one $2\frac{1}{2}$-cubic-yard power shovel. Fourteen bottom-dump Euclid wagons hauled the excavated material. Approximately 10,000 cubic yards of material were moved during a nine-hour shift.

Design of Roadway

The four lanes of the traveled way are of standard design of eight-inch portland cement concrete over four inch cement-treated subgrade. Shoulders, auxiliary lanes, and ramps are plant-mixed surfacing.

All weakened plane joints were at standard 15-foot intervals, and were cut with a power-driven saw to a uniform depth of two inches. The time for sawing these joints varied according to weather conditions. When weather was hot, the joints were sawed as early as six hours after the concrete was poured.

The production record for the portland cement concrete pavement was 45,000 cubic yards laid in 49 starts, averaging 917 cubic yards per day. The largest single day's output was 1,148 cubic yards, representing almost 2,000 feet of 12-foot-wide traffic

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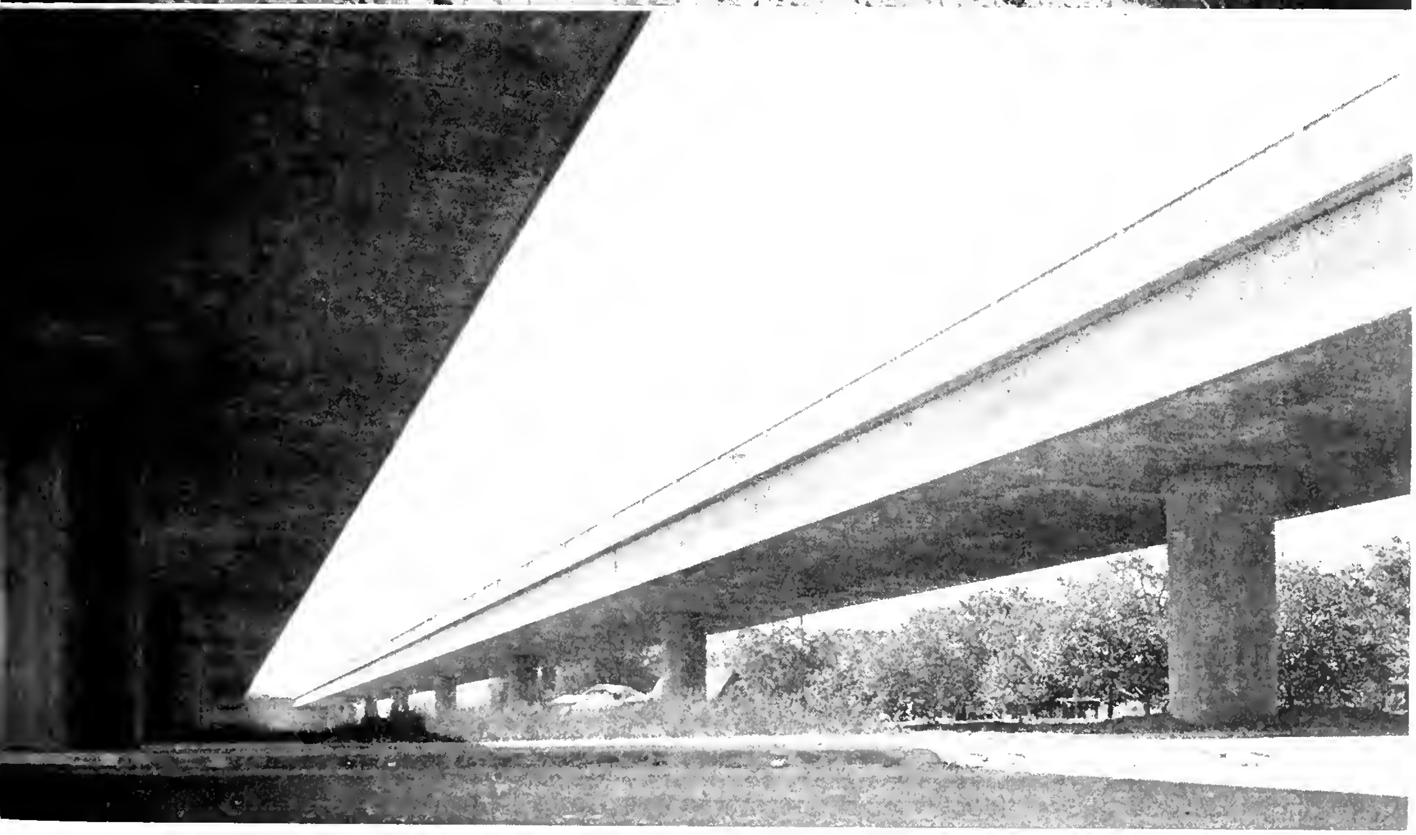
Freeway structure viewed from Monte Visto Avenue



PPER: Looking easterly along Ramona Freeway showing Ganesha Avenue Bridge in foreground. Ganesha Park and City of Pomona in background. LOWER: Looking westerly from under the two long bridges that span Garey Avenue and Orange Grove Avenue in the City of Pomona.

New Elvas Freeway

By A. M. NASH, District Engineer

TRAFFIC using the new Elvas Freeway, opening of which has been delayed by wet weather, will be afforded relief by lessening of the load on the present three crossings of the American River in the vicinity of Sacramento. At present, the three crossings—the Jibboom Street Bridge, the 16th Street Bridge, and the H Street Bridge—provide access from the fast developing area north and east of Sacramento to the Sacramento city area.

The average daily traffic and the peak hour traffic on these three river crossings are tabulated below:

Bridge	*1954 ADT*	*Peak hour*	*lanes*
Jibboom St. (County Bridge)	7,800	750	2
16th St. (Route 3)	63,600	6,100	4
H St. (Route 98)	33,900	3,200	4
	105,300	10,050	10

Traffic Figures

Surprisingly, the sum of the average traffic on the three crossings is in excess of that on the San Francisco-Oakland Bay Bridge.

In 1948, the two state highway crossings, the 16th Street Bridge and the H Street Bridge (Routes 3 and 98) carried an average daily traffic of about 55,000 vehicles on six lanes (counting both directions), carrying traffic in and out of the City of Sacramento on 12th Street, 16th Street and H Street which totaled 10 narrow lanes on a signalized city street system. Even at that time, congestion was considered intolerable. Since 1948, traffic across the American River has increased about 85 percent without any major traffic facility relief. There have been several "improvements" which have afforded some relief. These improvements include:

(1) Widening of the 12th Street Underpass, a city structure. (Completed in 1949.)

(2) The gradual development of an effective one-way street operation within the City of Sacramento.

(3) Widening the H Street Subway, the H Street Bridge and Fair Oaks Boulevard as a cooperative city, county and state project in 1951.

(4) Construction of the J Street Underpass and Interchange by the city, financed by local bond issue.

In the meantime, following the report of the 1947-48 Origin and Destination Survey of the Sacramento Metropolitan area, studies had been initiated for another crossing of the American River as recommended in that report.

Project Evolved

The project, which evolved from these studies is a four-lane freeway—with provision for expansion to six lanes—

. . . Continued on page 16

Elvas Freeway Bridges

By R. N. BRINK, G. D. GILBERT, Associate Bridge Engineers

ANOTHER link in the freeway system, which will ultimately connect the North Sacramento Freeway with the proposed South Sacramento Freeway will be completed with the opening of the Elvas Freeway to traffic.

This three-mile freeway will connect 29th and 30th Streets at the north city limits of Sacramento with the North Sacramento Freeway at Swanston Road.

The freeway is presently being constructed to provide a four-lane divided highway with provisions for future development to a six-lane divided highway.

Elvas Major Structure

The major structure in this new three-mile length of highway is the American River Bridge at Elvas. This river crossing was constructed under two separate contracts, at a cost of $1,612,473. This was done principally because of the structural steel shortage of 1950. The contract for the substructure was awarded July 26, 1950, to Lord and Bishop of Sacramento on their bid of $608,569 and the contract for the superstructure was awarded May 16, 1952 to Ukropina, Polich and Kral of San Gabriel on their bid of $1,003,904. Both contracts were delayed due to strikes, floods, and steel shortages with the result that all work was not completed until August, 1954.

The American River Bridge is in reality two parallel bridges, one for two lanes of eastbound and the other for two lanes of westbound traffic, with design details being based on future widening to three lanes in each direction. These structures are about 1,890 feet long and provide a clear roadway width of 28 feet between curbs. Each consists of eight riveted steel plate girder spans 125 feet long and 17 welded steel beam spans, two at 68 feet and 15 at 50 feet, all with reinforced concrete deck slabs, supported by concrete piers, bents, and abutments, with steel pile foundations.

Plate Girder Spans

The plate girder spans are approximately 125 feet in length with two 8-foot girders spaced 21 feet apart in each span. The deck slabs are 11¼ inches thick and designed with two cantilevers varying from five to six feet outside the girders.

The welded beam spans are composed of four 36-inch beams spaced eight feet apart. The deck slabs are 6¾ inches thick with 3-foot 10-inch cantilevers outside the beams.

The piers for the 125-foot spans are supported on 57 steel bearing piles 50 feet± long driven into the brown clay strata to refusal with the footings being some 15 feet

. . . Continued on page 16

This photograph shows the Elvas Freeway swinging off to left in background. The North Sacramento Freeway swinging toward right is shown in the center of picture. Arden Way passes under the freeway in center foreground.

NEW ELVAS FREEWAY

Continued from page 14 . . .

between 29th and 30th Streets and C Street in Sacramento to existing Route 3 near Swanston Road (Arden Way). With the completion of the freeway, traffic will use it and 29th and 30th Streets (as a one-way street couplet) in Sacramento to provide a north-south through route. The South Sacramento Freeway, for which rights of way are now being acquired, will terminate at 29th and 30th Streets near U Street and 29th and 30th Streets then will become a cross-town link between the South Sacramento Freeway and the Elvas Freeway. Future planning contemplates freeway development between 29th and 30th Streets, from U Street to C Street, linking these two freeways into a continuous north-south full freeway route.

The Elvas Freeway project, 2.9 miles in length, includes the A Street Overcrossing in the City of Sacramento, parallel two-lane bridges 1,889 feet in length across the American River, two railroad separations (the B Street and Elvas Underpasses), a grade separation (State Fair Overhead) providing access from one side of the freeway to the other for the new State Fair site, and structures for the interchange with Route 3 near Swanston Road.

Grade Separations

One of the two railroad grade separations is under the railroad's Elvas Wye. This railroad wye carries trains every few minutes for it connects the San Francisco-Sacramento main line from the West with the Roseville-Truckee transcontinental line and the Marysville-Red Bluff branch on the northeast and the Stockton-Los Angeles main line on the south. All three legs of the wye are double tracked. Construction of the Elvas Underpass involved extensive railroad work, in that tracks had to be moved several times and involved adjustments to the signal and switch interlocking system each move.

Work actually began in May of 1950 with the beginning of the contract for the substructure of the river crossing bridges. The project suffered a severe setback in 1951-52 as a result of steel shortages. The advertising of the B Street and Elvas Underpasses and the superstructure of the two river crossings were delayed for a considerable time until steel priorities could be cleared.

The opening of the Elvas crossing to traffic will undoubtedly attract appreciable volumes of traffic from both the 16th Street and H Street Bridges, thus providing considerable relief from the congestion and delay occasioned during peak periods by the large volumes of traffic now concentrated on these two structures.

The project will be completed under a total of six contracts as tabulated below:

Description	Contractor	Resident engineer	Construction period	Cost
American River Bridge Substructure	Lord and Bishop	T. C. Royce	May, 1950-May, 1952	$617,428
B St. and Elvas Underpasses	J. C. Gist	J. C. Nelle	June, 1952-Feb., 1954	1,386,778
Americon River Bridge Superstructure	Ukropina, Polich and Kral	R. N. Brink	June, 1952-Aug., 1954	1,047,570
Grading and structures north of river	Ukropina, Polich and Kral	D. R. Hislop	Dec., 1952-Aug., 1954	713,914
Grading, structures south of river, paving	Ukropina, Polich, Kral and Ukropina	D. R. Hislop	May, 1954-Dec., 1954	874,800
Highway lighting, illuminated directional signs	Reliable Elevator Works	D. R. Hislop	Aug., 1954-Dec., 1954	48,800
Total construction cost, exclusive of engineering and right of way				$4,689,290

ELVAS FREEWAY BRIDGES

Continued from page 14 . . .

below the present stream bed. The piers which are some 50 feet high are of cellular type with elliptical-shaped noses.

The two column bents for the approach spans are also supported on steel bearing piles and are founded well below the anticipated scour line.

Freeway Alignment

The horizontal and vertical alignment for the freeway in the vicinity of the bridge was controlled by the Elvas wye tracks of the Southern Pacific Company and the heights of the various levees along and adjacent to the American River. It was found desirable to go under the tracks while swinging northerly on a long 1,500-foot curve on an ascending grade to meet high water requirements at the south bank of the river. This alignment resulted in the 1,500-foot radius curve on more than one-third of each bridge requiring a superelevation transition on the structures. Since the river piers were placed parallel to the stream flow, much time was required for calculation of layout and elevations both by the designer and the men in the field.

The importance of good foundations cannot be overstressed especially when the flood of November 21, 1950, in this locality is recalled. Footing construction requiring cofferdams for five spans across the main channel, was under way at that time. Due to a sudden rise of 30 feet in the river, the contractor was unable to get his equipment to high ground and 18 pieces, including four cranes were submerged. Cofferdam work was then postponed until June, 1951.

Type of Cofferdams

A cofferdam is not an integral part of a finished structure, but merely a facility to place a footing below water level. The majority of our modern highway structures are built on dry land or across small streams that are dry during most of the construction season; thus eliminating the necessity for expensive cofferdams. Many old

Elvas Underpass under Southern Pacific tracks in foreground. This view of the Elvas Freeway is looking south toward Sacramento.

timers in construction work, when structures were built for water crossings only, are familiar with cofferdams of all types; but there are many others who are inexperienced in this type of work, hence it may be of interest to point out a few details of one of the simpler types of cofferdams as used on this project.

The footing area was first excavated to an open hole, commonly called a "glory hole," and leveled off to about one foot above water level to permit working in the dry as well as to eliminate the use of longer sheet piles. A crib (similar to a box without sides) consisting of two horizontal walers spaced seven feet apart was erected in exact position. Interlocking steel sheet piles, 16 inches in width, were then placed vertically around the crib thus forming the cofferdam. Considerable care and accuracy must be used in placing the sheets around the crib since one-fourth inch slack, as designed in each interlock, can (and often does) result in having too much space in which to place the last or "closing" sheet. This slack, if permitted to accumulate, will also permit the succeeding sheets to get out of plumb and cause instability of the entire group.

Driving Technique

After the cofferdam was erected the sheets were driven with a double acting steam hammer and the interior of the cofferdam excavated. It was expedient to drive the sheets about five feet, then excavate and lower the crib, and repeat the process until the desired elevation was reached, in this case approximately 15 feet below the stream bed. The next process was to drive the bearing piles and pour a tremie seal (concrete deposited under water through a tube operated in such manner as to keep the outlet end of the tube in fresh concrete at all times). After the concrete had hardened for five days, pumps were placed in the cofferdam and it was dewatered, thus exposing the seal and tops of bearing piles. After removing high spots from the top of the seal and preparing the tops of the bearing piles protruding through the seal, the main footing was placed thereon and the

"A" Street Overcrossing and floodgates are shown in center foreground with Southern Pacific Railroad line immediately in back of these structures. View is looking south toward Sacramento.

pier shaft poured above the river level. The cofferdam had then served its purpose and was removed by use of a steam hammer for extracting the sheet piles and a crane for removing the crib.

Important Details

Several very important details were continually checked: e.g., that the tip of the sheet piles were well below the bottom of footing; that the excavation inside the cofferdam was sufficiently low to permit swell during driving of the bearing piles; that the sides of the cofferdam were clean of any clayey material which might hang up in the irregular portions of the sheet piles; that the top of the bearing piles be at or above required grade; and that concrete having a proper slump (about 6 inches) was used for the seal.

During the fabrication of the welded steel beams some difficulties were encountered in attaining the required straightness. Proper sequence of welding was not established at once and considerable work was necessary to straighten several beams. The Materials and Research Department handled the shop inspection and through the cooperation of the fabricators, the difficulties were soon remedied and the remaining beams fabricated without incident. The beams, weighing five to eight tons each, were shipped to the job site via trucks and were readily erected in their final position by use of a truck crane.

Fabrication of Girders

The eight-foot plate girders, approximately 125 feet long, were fabricated in sections and shipped to the job by rail and by truck. Each girder, composed of three sections, was then assembled on the ground in a location convenient for erecting to its final position in the structure. Riveting of the field splices was not started until each assembled girder was checked for proper camber (two inches) and alignment and all unfair rivet holes reamed. After riveting was completed each girder (40 tons) was erected by use of two truck cranes of 20 and 25 tons capacity equipped with 60-foot booms.

No difficulties were encountered in placing the 2,200 tons of structural steel required for the superstructure.

Major Items

Major items and quantities involved in constructing the bridge are tabulated as follows:

;tructure excavation (Type "A")	4,413 cu. yds.
;tructure excavation (Type "B")	6,268 cu. yds.
:lass "A" concrete (footing)	1,475 cu. yds.
:lass "A" concrete (structure)	9,812 cu. yds.
;tructural steel	2,233 tons
;teel piling	43,798 lin. ft.
)riving piles	1,280 each
;ar reinforcing steel	617 tons
;teel railing	7,544 lin. ft.

Two views (see also below) of completed Elvas Bridge which will be opened to traffic when the Elvas Freeway is completed

There were eight other structures equired in this three-mile section, amely:

B Street Underpass: A two-span steel girder bridge carrying Southern Pacific Company tracks over the freeway.

A Street Overcrossing: A two-span tee-beam bridge carrying future A Street over freeway.

B Street Underpass Floodgate: A steel and timber portable gate system for flood protection.

Elvas Underpass: A double two-span steel girder bridge carrying the Elvas Wye tracks of the Southern Pacific Company over the freeway.

State Fair Overhead: A single span concrete slab to carry future Southern Pacific Company tracks under the freeway.

Route 98 3 Separation: A three-span box girder structure carrying Elvas Freeway traffic over Route 3.

Swanston Road Undercrossing: A three-span slab structure carrying

. . . Continued on page 20

EMPLOYEES RECEIVE TWENTY-FIVE-YEAR AWARDS

Employees of the Division of Highways who became eligible for their 25-year service awards prior to September 30, October 31, and November 30, 1954, are:

Name	Birthdate	Total service		
		Yrs.	Mos.	Days
ELIGIBLE ON SEPTEMBER 30, 1954				
District I				
Knight, Kenneth M	4-20-01	25	0	22
District II				
Burris, Victor S	10-23-93	25	0	5
District III				
Havey, Joseph C.	12-23-89	25	0	15
Frink, Lauriston H	1-23-98	25	0	18
District IV				
Pusey, R. C	4-21-98	25	0	24
Grover, Newell A.	12-12-99	25	0	21
District VI				
McKenzie, Roland H.	5-27-09	25	0	14
District VII				
Higley, Lawrence S.	10-25-07	25	0	19
Mohr, William H.	7- 4-06	25	0	19
Hoy, A. W.	4-12-06	25	0	14
Greeley, John William	11-28-02	25	0	04
District VIII				
Lambert, Theria D.	6-24-91	25	0	26
Comerford, William L.	3-27-00	25	0	16
District X				
Stevens, Arthur L.	11-22-92	25	0	7
District XI				
Ruplinger, Paul E.	6-16-06	25	0	1
Headquarters Shop				
Kingman, Harold V.	3- 4-00	25	0	21
Central Office				
Stanley, Jerome N	10-22-00	25	0	8
ELIGIBLE ON OCTOBER 31, 1954				
District I				
Boulware, Verne A.	4-25-03	25	0	9
Martin, Melford S.	1-24-11	25	0	22
Totten, Raymond G.	2-13-02	25	0	26
Togni, Chester W	12-21-04	25	0	16
ELIGIBLE ON OCTOBER 31, 1954 — Continued				
District IV				
Delee, Charles W	5-24-06	25	0	15
Beckwith, George L.	7- 2-96	25	0	20
District V				
Burger, Roy H.	5-31-96	25	0	3
Hysell, Clarence A.	2-21-02	25	0	29
District VI				
Percival, Robert B.	11- 6-03	25	0	14
Stearns, Philip B.	8-17-05	25	0	16
District VII				
Aisthorpe, C. L.	7-15-05	25	0	4
Warnick, Benjamin A.	6- 5-97	25	0	15
District VIII				
Kaufman, Howard J.	1- 1-93	25	0	10
Reith, Joe Francis.	10-30-03	25	0	28
Headquarters Shop				
Sanford, Albert H	1-31-01	25	0	19
Bridge Department				
McIntyre, William A.	10-10-03	25	0	24
Babb, George A.	1-14-08	25	0	22
Central Office				
McCorkle, Nathan C.	4-12-02	25	0	7
Welch, William L.	4- 5-02	25	0	2
ELIGIBLE ON NOVEMBER 30, 1954				
Katerndahl, Ella M.	2-21-92	25	0	27
Beaty, M. E.	12-15-97	25	0	12
Hinsdale, Charles C.	8-18-92	25	0	12
Kane, William	2- 7-91	25	0	24
Bowers, H. Dana	7-27-03	25	0	7
Bagley, Fritz A.	4- 5-10	25	0	24
Hicks, Neal D.	1-24-10	25	0	2
Lyon, Charles H.	8-13-92	25	0	7
Cross, J. Clive	1-14-13	25	0	26

ELVAS BRIDGES

Continued from page 19 . . .

Route 3 traffic over Swanston Road.

Swanston Road On-Ramp Undercrossing: A three-span slab structure carrying Swanston Road traffic onto Elvas Freeway.

Structures North of River

The structures to the north of the American River, that is, State Fair Overhead, Route 98-3 Separation, Swanston Road Undercrossing and Swanston Road On-Ramp Undercrossing and the grading from the river crossing to Swanston Road were awarded to Ukropina, Polich & Kral November 13, 1952, on their bid of $728,139.

The final contract for constructing A Street Overcrossing, B Street Underpass Flood Gate, grading from C Street to south end of river crossing and placing concrete paving over the entire length was awarded April 9, 1954, to B. J. Ukropina, T. P. Polich, Steve Kral & John R. Ukropina on their bid of $815,459.

The Elvas and B Street Underpasses were awarded to John C. Gist of Sacramento May 12, 1952, on their bid of $914,182. In addition, the Southern Pacific Company expended approximately $343,000 handling rail traffic and revising signals and wire installation.

Governor Wants Full Completion North Bay Span

Evidencing his great interest in highway and bridge construction projects, Governor Goodwin J. Knight personally inspected jobs in the San Francisco Bay area, including San Francisco freeways, widening of the southern approach to the Golden Gate Bridge toll plaza, the six-lane divided Waldo approach job, the new six-lane divided bridge over Richardson Bay, and the site of the Alto grade separation structure to be started next spring. An inspection was also made of the Richmond-San Rafael Bridge, scheduled to be open for traffic in October, 1956.

The Governor made the following statement of policy with reference to completion of the lower deck of the Richmond-San Rafael Bridge:

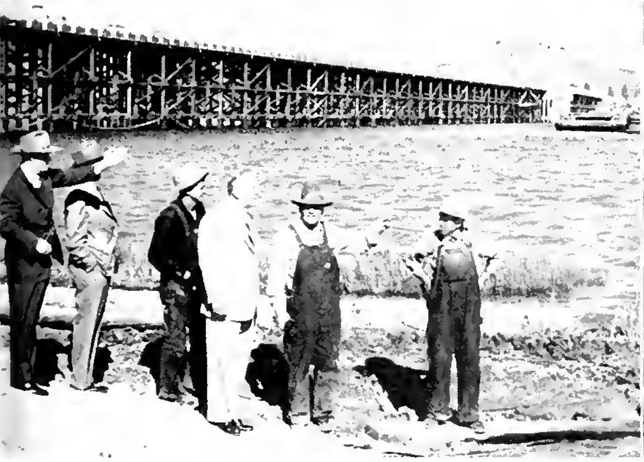
"It is of great importance to the Richmond-San Rafael Bridge project that the second or lower deck should be built as part of the present construction job, rather than wait for several more years to do it as originally planned.

"The second, or lower deck, will provide for a divided six-lane highway—three lanes on one deck going east, and three lanes on the other deck going west. This will permit the accommodation of much more traffic and also increase safety factors.

"Already several million dollars have been saved on the current construction program and will be used to help finance the second, or lower deck of the bridge. My administration is adopting the definite policy of proceeding with this lower deck now, and the steps necessary to insure construction will be taken immediately.

"Additional legislation is not necessary. Certain moves will have to be taken by the California Toll Bridge Authority when it convenes.

"I am directing my Director of Public Works, and Secretary of the California Toll Bridge Authority, Mr. Frank B. Durkee, to take all necessary steps. These include:



UPPER LEFT: Director of Public Works Frank B. Durkee points out to Governor Knight features of new Waldo Tunnel Approach to Golden Gate Bridge, a cooperative project of the State, and the Golden Gate Bridge and Highway District, involving construction of a six-lane, divided freeway. UPPER RIGHT: First official inspection of the Richmond-San Rafael Bridge shows Governor Knight leading group of public officials, engineers and contractors at the end of completed 1,700 feet of upper deck on Richmond side. It was here that Governor made announcement of administration policy that lower deck would be completed now under present construction program, rather than several years later. LOWER LEFT: Governor Knight inspects site of new six-lane, divided bridge over Richardson Bay in Marin County, to replace obsolete four-lane structure shown in background. LOWER RIGHT: With Contractor Charles L. Harney, Governor inspects section of Bayshore Freeway at 13th and Mission Streets, San Francisco.

1. Determine the amount of additional funds required to finance completion of the construction of the lower deck.
2. Discuss with bond advisors the procedures required to secure additional financing.
3. Prepare necessary resolutions for adoption by the Toll Bridge Authority to carry this policy into effect.

"I am confident that this bridge will carry an immense flow of traffic and that the construction of the second deck now will more than justify itself. It is good business to do this job now."

FISHERMEN SET RECORD

California sport fishermen caught an estimated 44,000,000 fish in inland waters during 1953 to break all previous records, according to the National Automobile Club. Trout made up approximately 50 percent of the catch.

New Span

Dedication of Ten Mile River Bridge and Approaches Held

An October coastal shower, while wetting the participants and spectators alike, failed to dampen the enthusiastic spirits of some 200 Mendocino Coast highway boosters as they witnessed the formal dedication of the new Ten Mile River Bridge and highway approaches north of Fort Bragg.

A green ribbon, festooned with forest foliage and suspended between two Mendocino County conifers which were lashed to the bridge railing, was symbolically cut by Frank B. Durkee, Director of Public Works. His action culminated a colorful, if somewhat damp, ceremony officially dedicating this spectacular bridge to the public use and opening the roadway to vehicular passage.

Official Caravan

Paced by the official caravan car which included, in addition to Director Durkee, Fred W. Panhorst, Assistant State Highway Engineer, under whose direction this graceful bridge was designed and built, the first traffic moved slowly over the structure and its roadway approaches.

Ten Mile River merges with the Pacific Ocean at a point approximately 7½ miles north of Fort Bragg. The Mendocino Coast is spectacular throughout its entire length, and at this particular point the new highway bridge adds its own beauty to the area. The new structure is 1,351 feet long and provides a 26-foot-wide roadbed. Of reinforced concrete throughout, the design is most pleasing and harmonious with the area.

On New Alignment

The over-all length of the project is 1.4 miles with most of the road approach work on new alignment southerly from the bridge. The 26-foot-wide roadway is surfaced with cement treated base material and road mixed surfacing.

Bishop, Younger and Bradley, of San Francisco, was the contractor on the project with Al Erickson in charge of the structure work. The project was under the direct supervision of the Bridge Department with George Hood and Loren Kreuger in charge as resident engineers. Robert Brown represented the district on the road portions.

New Ten Mile River Bridge in Mendocino County

Exclusive of rights of way and engineering, the contract value of the work was in the vicinity of $700,000.

The original bridge over Ten Mile River was a high, timber, deck truss bridge built by Mendocino County in 1915 and had a traveled way width between rails of 15 feet. It became the responsibility of the Division of Highways in 1933 when this portion of the Shoreline Highway was taken into the state system.

Old Bridge Posted

Constant repairs by state forces had contrived to keep this structure in a condition capable of carrying legal loads. By 1952, however, this repair work was no longer enough to keep up with the incrased demands of traffic, especially heavy log hauling.

The bridge was posted, therefore, for weight limits on July 3, 1952, and plans were expedited for the immediate construction of a temporary detour bridge downstream from the old bridge. The need of this temporary structure and its approaches was particularly urgent because the imposed load limits on the old bridge hampered the lumbering industry to a certain extent because of the necessity of longer haul distances and hauling uneconomical-size loads.

Temporary Structure

The temporary bridge and approaches thereto were constructed be-

Officials at dedication, left to right: Charles Kasch, Commissioner, Division of Beaches and Parks, Ukiah; Harold Bainbridge, Supervisor, Fort Bragg; Fred W. Panhorst, Assistant State Highway Engineer, Sacramento; Frank B. Durkee, Director, Department of Public Works, Sacramento; Al Erickson, contractor's representative; Frank Hyman, program chairman, Chamber of Commerce, Fort Bragg; Joseph Hartley, Supervisor, Hopland; V. M. Moir, State Chamber of Commerce, Santa Rosa; L. R. Howsley, President, Chamber of Commerce, Fort Bragg; Alan S. Hart, District Highway Engineer, Eureka; Arthur W. Way, State Senator, Eureka; James Busch, State Senator-elect, Ukiah; Bert Busch, State Senator, Lakeport.

tween August 4 and September 12, 1952. This bridge was approximately 500 feet long with an 18-foot-wide roadway.

As soon as the temporary bridge was completed and placed in service, plans previously started for the new permanent bridge were rushed to completion.

Work started on the permanent structure on May 12, 1953, culminating in the dedication one year and five months later.

The dedicatory ceremonies were concluded on October 16, 1954, with a dinner in Fort Bragg given by the Fort Bragg Chamber of Commerce under whose guidance the entire dedication program was handled. L. R. Howsley, President of the Fort Bragg Chamber of Commerce, presided at the dinner, with Angelo Penitenti as master of ceremonies. Director Durkee was the principal speaker at the dinner.

Frank Hyman, of the Fort Bragg Chamber of Commerce, was the program chairman for the event and handled all of the details which were involved in bringing about a successful dedication to public use of a major unit of the Shoreline Highway.

TRAFFIC FATALITY RATE

The traffic fatality rate for the United States during 1953 was 7.1 per 100,000,000 vehicle miles, the lowest traffic fatality rate since records have been kept, according to the National Automobile Club.

MOTOR VEHICLES STOLEN

A total of 1,444 vehicles were reported stolen in California during the month of September, according to the National Automobile Club. These vehicles were valued at more than $720,000.

REQUEST GRANTED

San Francisco

K. C. Adams, *Editor*

Dear Mr. Adams: For many years I have been privileged to be on the mailing list for your magazine and have always enjoyed it to the utmost, keeping up to date on the progress of the state highways, and now that I am retired from Standard of California, I hope that I may be privileged to continue on the mailing list.

My associations with the Right of Way Department of Standard brought me into many pleasant contacts with Frank Balfour and his crew, and there is nothing that I should like better in my present unattached capacity than to keep in touch with the affairs of your department, as exemplified by your magazine, *California Highways and Public Works.*

Sincerely yours,

S. W. Selfridge

GUARD RAILING REDUCES SEVERITY OF ACCIDENTS

By M. H. WEST, District Traffic Engineer, District XI

US 101 in Leucadia in San Diego County was the scene of numerous accidents involving single vehicles striking trees adjacent to the roadway. Installation of metal plate guard railing along trees in the median and along trees on the easterly side of the northbound lanes has resulted in a marked reduction in the frequency and severity of single vehicle accidents.

This portion of US 101 is 2.17 miles in length. It consists of 0.65 mile of four-lane undivided highway with cypress trees flanking the easterly shoulder, and 1.52 miles of four-lane divided highway with cypress and eucalyptus trees in the 20-foot median, along the easterly shoulder, and behind the westerly curb line.

Northbound Vehicles Strike Trees

Accident studies over a period of several years revealed that 83 percent of the total number of accidents, in which vehicles collided with trees, occurred in the northbound lanes. This indicated preferential protection treatment for northbound traffic. A contract was completed in September, 1953, for the installation of 10,136 linear feet of metal guard railing along the right shoulder of the northbound lanes at tree locations and along both sides of the median. No guard railing was installed on the westerly side of the roadway. The project included the removal of 215 trees 4 inches to 49 inches in diameter, many of which were in poor condition and misshapen. This thinning operation greatly improved the appearance of the area and likewise resulted in a reduction in guard rail cost. The contract price for this work was $77,461 of which $38,011 was for metal plate guard railing. The work also included construction of concrete curbs and paving of median lanes at the several crossovers.

Guard Railing Reduces Accidents

Before-and-after accident studies indicate that significant results have

These photos show how guard rails prevented auto collisions with trees

been achieved as a result of the guard railing installation. Comparison of accident records for a one-year period after construction with a one-year period before construction indicates that the number of single vehicles striking objects during the after period was reduced 35 percent (from 26 to 17), the number of fatalities was reduced 67 percent (from 6 to 2); and the number of persons injured was reduced 22 percent (from 27 to 21). These reductions were made in the face of a slight increase in average annual daily traffic. One fatality, during the after period, was the re-

. . . Continued on page 63

Traffic Signals

What the Average Driver Should Know About Safety Devices

By R. W. MATTHEWS, Assistant Traffic Engineer

The traffic signal is a valuable device for the control of vehicles and pedestrians because it assigns right-of-way to the various movements at intersections. The traffic signal is not necessarily a safety device and it is certainly not a cure-all. In some instances the accident frequency may be increased after the installation of signals at an intersection. This is especially true of the rear-end type of accidents. However, if the traffic signal is justified by traffic and roadway conditions and is well designed, effectively placed, properly operated, and well maintained, it will facilitate the flow of traffic in a safe and orderly manner.

Two Types of Signols

Traffic signals are of two general types: (1) the fixed time signal and (2) the traffic actuated signal.

The fixed time signal is operated by a synchronous electric motor similar to your electric clock. This controller provides a fixed green time on the highway and a fixed green time on the cross street. For instance, we could have 40 seconds of green on the highway and 20 seconds of green on the cross street. This cycle would be repeated and repeated without regard to changing traffic conditions.

The traffic actuated signal is quite different in that the length of green light on the highway and on the side street depends on the number of cars approaching the intersection on each of the two streets. Vehicle detectors are placed in the pavement on all approaches to the intersection, and when a car goes over a detector an impulse is sent to the controller. The controller is actually an electronic computer which provides the length of green time on both streets as required by the number of cars on that particular street. In general, the more cars approaching the intersection on either street the longer will be the green light for that street.

Two-way Signals

Most signals are of the two-way or two-phase type. This type of signal provides a green light for first the main street and then the cross street and then repeats. In some cases we have a very heavy left turn movement. Frequently it is necessary to provide a separate way or phase for this movement.

Figure 1 illustrates a three-way traffic actuated signal. In the "A" phase, the through highway traffic has a green light and the left turn traffic and cross traffic have red lights.

In the "B" phase, the left turn traffic has the green light.

In the "C" phase, the cross street traffic has the green light.

This signal system can also be arranged to permit through traffic in one direction to move with left turn traffic in the same direction.

The traffic actuated signal is used mostly in isolated locations.

Progressive Signal System

Fixed time signals, because they are operated by synchronous motors, can be coordinated to provide a progressive movement through a series of signals on a major street.

Figure 2 illustrates a time space diagram of a progressive signal system.

The main street is designated by the horizontal line at the top of the diagram. The various cross streets are designated by the vertical lines above the horizontal line.

A traffic signal has been installed at 54th, 56th and 57th Streets but not at 55th Street.

The vertical distance down the sheet represents time in seconds. The light vertical bars at the signalized intersections represent green time and the dark vertical bars represent red time. Thus, you can see that at the 54th Street intersection there are 40 seconds of green time and 20 seconds of red time. Now suppose you are traveling on the Main Street approaching the 54th Street intersection and the signal is red. You stop and after waiting a bit you get the green light. As soon as the light turns green, you start up and travel at the speed of 25 miles per hour. You will find that by the time you arrive at 56th Street the signal will be green and by the time you arrive at 57th Street the signal will be green.

However, if when you started up at the beginning of the green light at 54th Street and had traveled 40 miles per hour or faster you would find that the signal at 56th Street would be red when you arrived there and you would have to stop.

Perfect Progression Not Possible

Also, if when you started up at the beginning of the green light at 54th Street you had traveled only 15 miles per hour you would find that when you arrived at 56th Street the signal would be red and you would have to stop. In other words, this particular progressive system has a rated speed of 25 miles per hour.

It is hardly ever possible to provide a perfect progression in both directions through a signal system. For instance, for a perfect progression a 30 miles per hour speed would require the signalized intersections to be 1,100 feet apart under average conditions. Any variation from this will reduce the progressive band width.

In our case, the intersections of 54th, 56th, and 57th had signals but 55th Street did not. You will note that it took us about 40 seconds to travel the two blocks from 54th Street to 56th Street, and if we travel in the other direction in this system it will take us only half that time or 20 seconds to travel the distance of one block from 57th Street to 56th Street. It is these differences in travel time caused by unequal signal spacing that often make it difficult to provide an efficient progressive system.

An Example

As an example, in our system here if you were traveling again on Main Street but arrived at 54th Street about 30 seconds after the light had turned green, you would find that even though you traveled at the rate of 25 miles per hour when you arrived at 56th Street you would have a red light and would have to stop. Of course, you could have speeded up a little and gotten yourself back into the progressive band.

In many urban areas the heavy traffic volumes are directional at various times of the day. For instance, in the morning, most of the traffic may be coming into the downtown area and in the evening most of the traffic may be going out of the downtown area. Provisions can be made in signal systems to facilitate the heavy inbound traffic flow in the morning, giving them a good progressive movement at the expense of the light outbound traffic. This system can be reversed for the evening heavy outbound traffic flow. During the day an average arrangement such as shown in the diagram could be used.

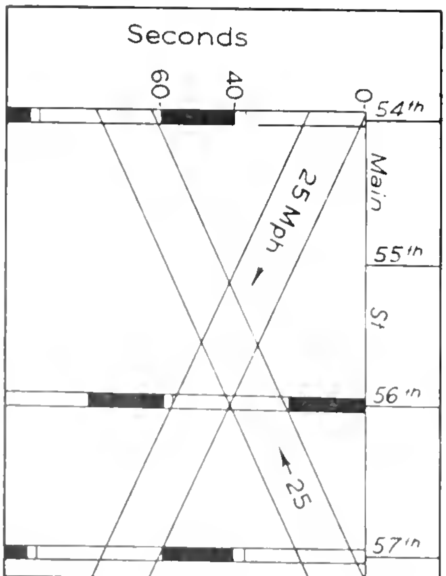


CHART 2

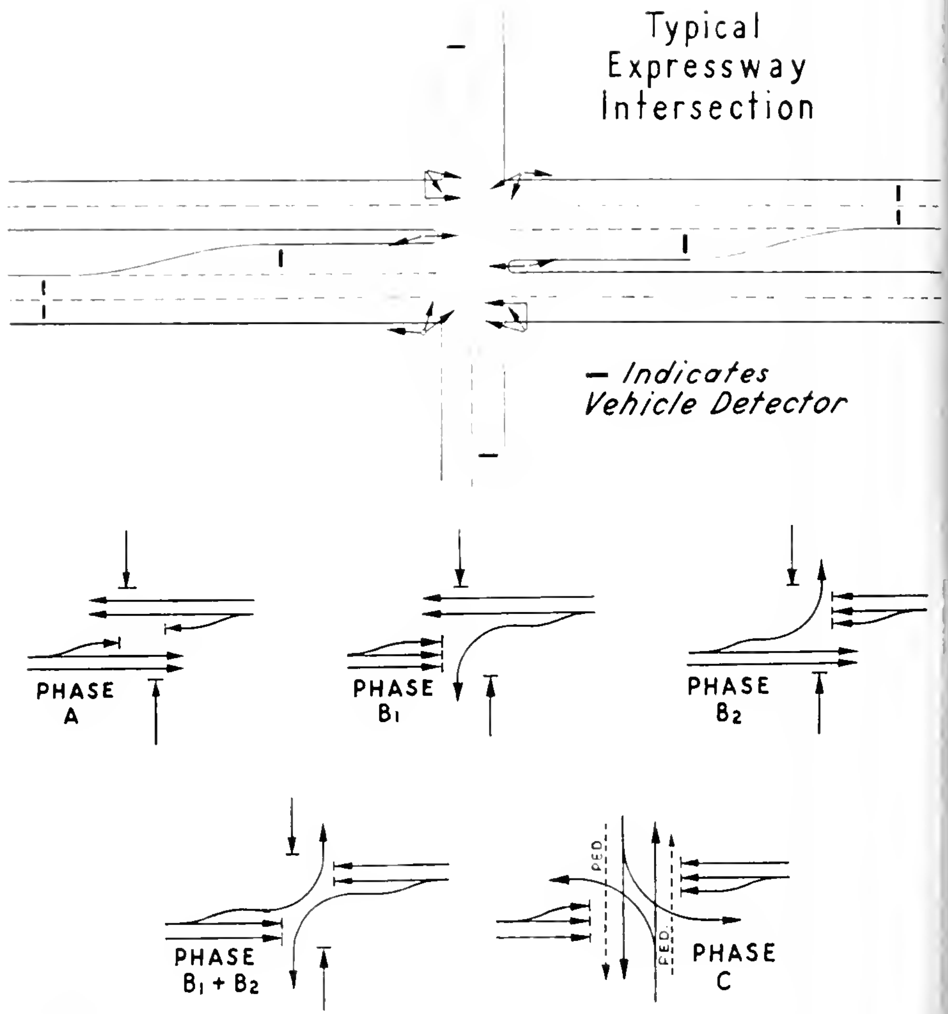


CHART 1

Combination of Features

In some of our newer progressive signal systems, a combination of fixed time and traffic actuated features is involved. In this case a vehicle detector is placed on each cross street approach. The progressive band is set up in the normal way but as long as no car has actuated the detector on the side street, the signal will remain green. Now if we are again traveling on Main Street and arrive at 54th Street intersection about 30 seconds after the beginning of the green and we travel at the speed of 25 miles per hour, we will find that when we arrive at 56th Street we will get a green light instead of the red light if there are no waiting cars on 56th Street. We can then continue on through the remainder of the progressive system.

You can see from the diagram that if we placed a signal at every intersection there would be very little progressive movement of traffic and this would result in intolerable delay. Signals are placed on the State Highway System only after an engineering study which takes into account the vehicle volume, turning movements, pedestrian volume, speeds of vehicles, details of physical layout, accident record and relationship with adjacent signals. If such a study shows that the proposed signals will provide safe and orderly movement of traffic, the installation is considered justified. If the study shows that the installation will create delay and probable accidents, the installation is not considered justified.

MOTOR VEHICLE DRIVERS

There are an estimated 70,000,000 motor vehicle drivers in the United States, according to the National Automobile Club.

Road Bond Issue

Contra Costa County Makes Big Strides With FAS Program

By W. C. DALTON, Construction Engineer, Contra Costa County

Progress on Contra Costa County's road bond issue program has moved ahead another important step with the completion of the second project financed with bond and FAS funds. A 2.6-mile section of the Pleasant Hill Road connecting with State Highway Route 106, the Arnold Highway, was recently finished by the Alves Construction Company of Pittsburg. This project involved modernization of 1.4 miles of existing roadway and 1.2 miles of construction on a new location which connects with the Arnold Highway at the intersection of Alhambra Avenue, the main route to Martinez. The county, under an earlier contract with Alves, had extended Alhambra Avenue from the city limits to the Arnold Highway.

The new intersection area had been established by joint studies of the Division of Highways, Contra Costa County, and the City of Martinez. Location surveys of the county route were made in the 1930's by George Berry (now Assistant County Road Commissioner) to coincide with the construction of the Arnold Highway. In spite of the route planning previously accomplished and the general state-county-city agreement regarding an intersection which would conform with the future development of the state freeway, public interest in the project demanded full exploration of all alternates. The original location provided a better intersection and a lower cost than any other proposal, as well as best serving the present and future road needs of local and regional traffic.

State-County Cooperation

Continuous state-county cooperation in road matters, and on this road in particular, resulted in the installation of traffic signals and channelization of the new intersection by state contract. Additional lanes and width, as well as islands and traffic-actuated signals, have been completed to coincide with the opening of the new county route. Contractor for the $45,000 state project was Gallagher and Burk of Oakland, and D. R. Burns was the Division of Highways' Resident Engineer.

The county project, which was started November 24, 1953, provides two 12-foot traffic lanes flanked by 8-foot shoulders, but also provides two additional passing lanes 800 feet long at the summit. Four channelized intersections, two box culverts, 3,200 lineal feet of concrete-lined channel, and extensive underdrains were features of this project. The structural section included two and one-half inches of plant mixed surfacing on traffic lanes and one and one-half inches on shoulder areas over six inches of crusher run base. Imported and selected materials up to 20 inches in depth were used under the crusher run base to attain adequate structural values. Construction costs for this project will total $440,000.

McCOY COMMENDS COUNTY

Commenting on the accompanying article State Highway Engineer Geo. T. McCoy said:

"A significant feature of the Pleasant Hill Road project described in Mr. Dalton's article is the limitation of access on a portion of the relocated section. On the Kirker Pass improvement, next in line for construction, Contra Costa County has not only acquired sufficient rights of way for ultimate additional lanes but has also provided for limitation of access on almost the entire 4.4-mile project.

"The county is to be commended on its foresight in applying the freeway principle to important county roads. Access control has proved of tremendous value in preserving for future generations the safe, free-flowing characteristics built into modern state highways, and it is bound to be equally valuable in the case of county roads where applicable."

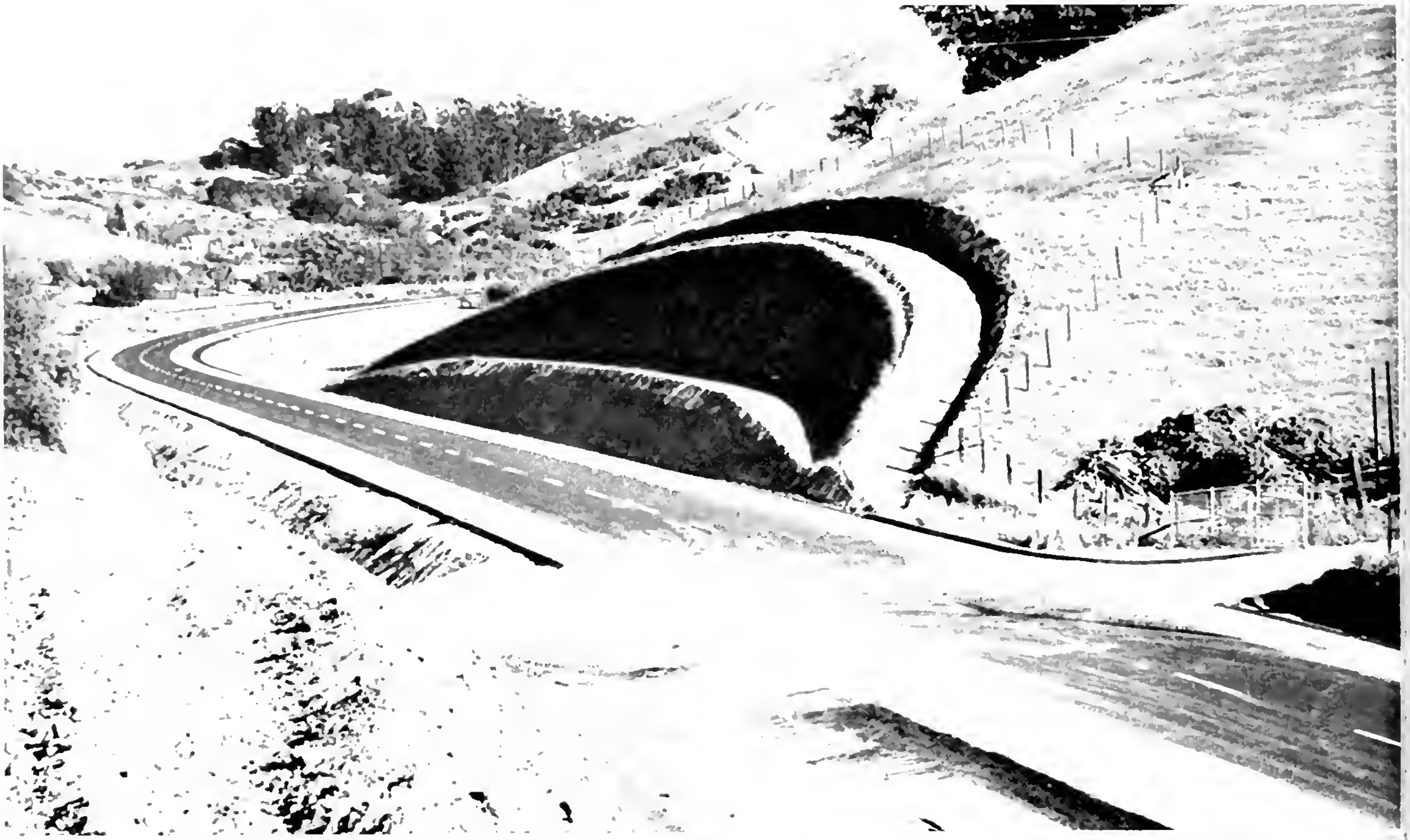
First of Series

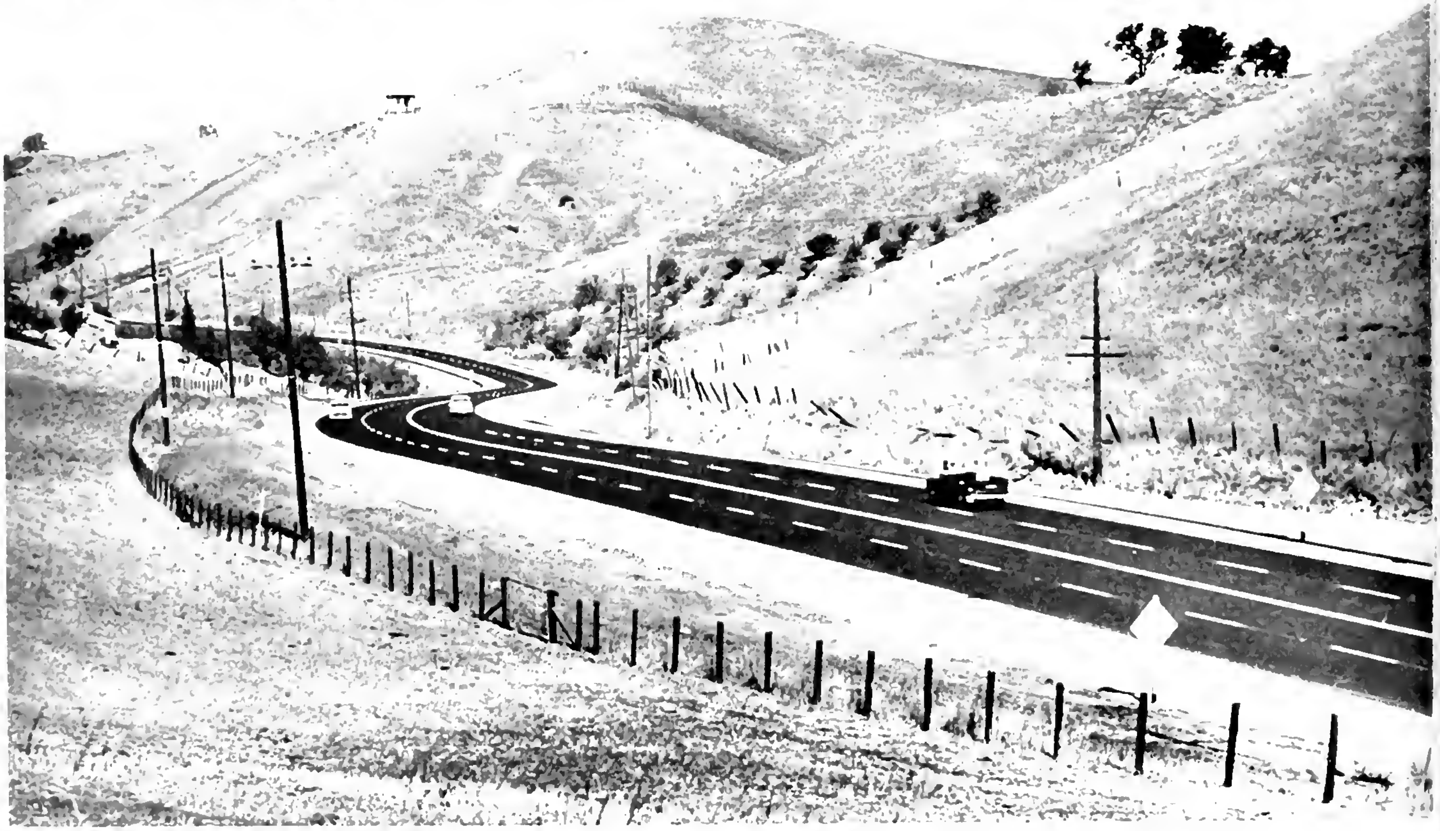
This project is the first in a series planned for the entire Pleasant Hill Road, which connects the Martinez area at State Sign Route 4 with the Lafayette area at State Sign Route 24. The total length is eight miles and the bond estimate has provided $1,300,000 for improvement to modern two- and four-lane standards.

About a year has passed since the completion of the first road bond issue contract, which was also an FAS project. The third and largest such project, the Ignacio Valley road extension to Kirker Pass Road, has now been advertised by the Division of Highways. Its 4.4 miles will provide a new and shorter link between the central and eastern sections of the county. On these projects, Contra Costa County usually does the preliminary engineering, prepares plans, and submits the project at this stage to the Division of Highways for review, preparation of specifications, and advertising. In this particular project, however, a consulting engineer assisted in the preparation of plans and field survey work. Construction engineering will be handled by county engineers.

Program Gathers Momentum

The county highway bond issue program is gathering momentum with the expected construction completion total reaching $2,000,000 by the end of 1954. Another $1,300,000 will be under contract by the end of this year, and it is anticipated that bond issue contracts totaling over $2,300,000 will be advertised in 1955.





UPPER: Completed 40 foot wide Pleasant Hill Road. Constructed by Contra Costa County as FAS and bond issue project. LOWER: Pleasant Hill Road in Contra Costa County following completion. Note four-lane passing section over summit.

Among next year's projects will be additional four-lane construction on the San Pablo Dam Road near Richmond, a new Crockett road connecting US 40 near the Carquinez Bridge with the Arnold Highway, four-lane construction on the Lafayette end of the Pleasant Hill Road, and modernization of Buchanan and Somersville Roads in the Pittsburg area, Moraga Road in Lafayette, and Waterfront Road near Martinez. Several of the proposed projects will be of more than local interest because they will provide cross-county traffic with new or improved alternate routes not closely paralleled by state highways. Virtually every larger bond project intersects a state highway and in many cases, will involve reconstruction of state facilities such as was necessary on the Pleasant Hill project. Some of this work will be on new state freeways such as the multimillion-dollar section through Richmond, San Pablo, and El Sobrante, and some will involve revision of existing intersections. The close cooperation, which resulted in the integrated construction of this latest project, will be continued.

Early Bond Issue Project

Many people familiar with highway problems have exhibited considerable interest in Contra Costa County's approach to its traffic problems, and it might be appropriate to mention here that this is not the first road improvement program in this county financed by a bond issue.

Shortly after World War I, the need for road improvements in Contra Costa County was so apparent that a $2,600,000 road bond issue was passed by a 20-to-1 margin. Work was started on the first project the month after the election in July of 1919, and the peak of construction came in 1921 when over half of the entire program was completed. A majority of these improvements later became state highways, and some of this mileage has since reverted back to the county when freeways on new locations superseded the old roads.

Seventy-three miles of portland cement concrete and 37 miles of asphaltic macadam-surfaced roadways were completed from 1919 to 1923. An unusual feature in the design of concrete pavements was introduced in the use of the eight-foot concrete traffic lanes separated by a four-foot divider strip surfaced with asphaltic materials. The service given by the concrete slabs constructed at that time has been remarkable in that many

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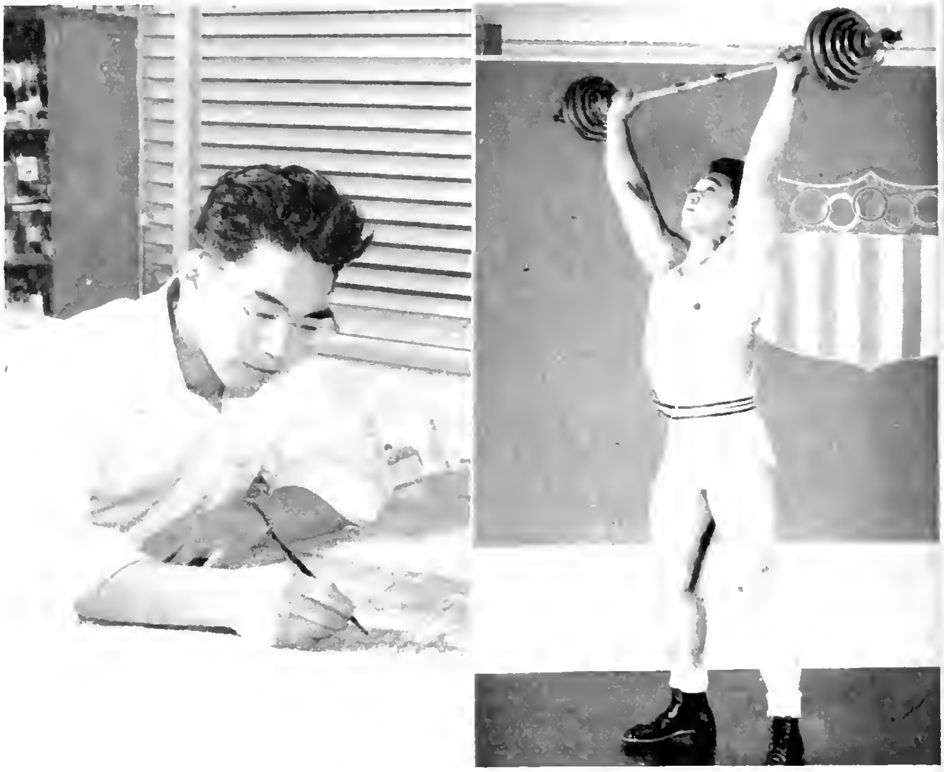
Two views of federal aid secondary county highway near Martinez. This section was constructed on a limited access freeway basis.

A Champion

Tommy Kono Sets New Record in Weight Lifting



Tommy Kono is shown at his desk in the drafting room of the Division of Highways at Sacramento and exhibiting the skill which won him his weight-lifting championship

THE STATE Department of Public Works can now boast that it has a world champion among its employees. He is Tommy Kono, 24, draftsman in the Highway Planning Section of the Division of Highways at Sacramento, who recently returned from the World Weightlifting Championships in Vienna, Austria, where he won first place in the light heavyweight division.

Tommy defeated the former title holder, Lomakin, a member of the Russian team, and established a new world's record for the light heavy class.

During the same series of lifts, he also broke the world's light heavyweight record for the clean and jerk, lifting 381 pounds to better a record of 379 pounds established by himself a few days before while in training in Copenhagen.

New World's Record

Later, while on an exhibition tour in Lille, France, he also established a new world's record in the two-hand military press, lifting 288½ pounds to better the old record by more than seven pounds.

While in Europe, the American team, of which Kono is a member, visited Denmark, Sweden, France, Austria and England, giving exhibitions in many cities and at U. S. Army camps.

Tommy, a native of Sacramento, first achieved international prominence as a weight lifter in 1952 when he was chosen as a member of the American Olympic team sent to Finland. At Helsinki, he won first place in the 148-pound lightweight class, lifting a total of 798 pounds in three lifts.

Also taking part in the games at that time was the man who was to be Tommy's opponent in Vienna this year, the Russian Lomakin. Lifting in the light heavy class, Lomakin hefted a total of 925 pounds to win first place in this division and establish a new world's record.

Defeats Russian

It was also at the 1952 Olympic games that Tommy began to show his versatility as a shift-around man. Although a natural middleweight at the time, he reduced from 171 to 148 pounds to enter a lighter class and better the American team's chances.

This year, in Vienna, he performed the same feat "in reverse," increasing his weight so that he could participate as a light heavy against the Russian champion, Lomakin.

It was a gamble on the American team's part. During the 1952 Olympics Lomakin, as a light heavy, had lifted 127 pounds more than Tommy, then a lightweight, and although Tommy had increased his lifting capacity greatly in the intervening two years, it was only natural to suppose that the Russian would be able to better his 1952 total as well. The question was, how much.

There was a certain amount of tension in the air as the Russian performed his three lifts and it was determined that he had lifted a total of 942 pounds, 17 pounds better than his 1952 record.

Sets Another Record

And then it was up to Tommy. In three lifts he made a total of 959 pounds, bettering Lomakin by 17 pounds and surpassing his own total as a lightweight at the 1952 Olympics by 161 pounds. He had established a new world's record for the light heavyweight class. The feat also won for him the best lifter award for 1954.

Queried about the Russian team, Tommy said that they were quite friendly this year, in marked contrast

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Stepping Stones

Santa Cruz County Completes Seventh FAS Road Project

By WALTER I. NILSSON, Resident Engineer

On August 23, 1954, the Director of Public Works of Santa Cruz County accepted the work done on Mt. Hermon Road between Camp Evers and Mt. Hermon, which officially completed the seventh step in the county's advance toward the total improvement of its Federal Aid Secondary Highway System.

For the past eight years the county has been cooperating with the State Division of Highways and the U. S. Bureau of Public Works in an effort to keep the county's FAS system abreast of the Nation's expanded highway program. Preliminary and construction engineering connection with the federal aid secondary program is done by county forces in conformity with the State's Standard Specifications and the design and actual construction are accomplished in close cooperation with representatives from the state and federal agencies.

Seven Projects Completed

The seven projects in the county's FAS Road Program, completed in the past years, are as follows:

1. San Andreas Road—2.3 miles.
2. Corralitos Creek Bridge.
3. Soquel Creek Bridge south of the Town of Soquel.
4. Summit Road—1.2 miles.
5. Watsonville to Freedom Road—1.1 miles.
6. San Lorenzo River Bridge on Bear Creek Road.
7. Mt. Hermon Road—1.3 miles.

Two views of Mt. Herman Road in Santa Cruz County after reconstruction under the Federal Aid Secondary Highway Program. UPPER: Completed Mt. Hermon Road, between 1.8 miles easterly of State Route 166 and 0.4 mile westerly of Sign Route 17. LOWER: Mt. Hermon Road, between 1.8 miles easterly of State Route 116 and 0.4 mile westerly of Sign Route 17.

The Mt. Hermon Road improvement consisted of widening the present traveled way from 16 feet to 22 feet, with additional shoulder width of five feet on each side, and general realignment to eliminate the many existing sharp turns and steep grades. The existing road built in 1925 had curves with radii as small as 200 feet and in many cases the sight distance was reduced to practically zero due to the winding nature of the road. The present alignment has less than half the number of curves than previously, and these are flattened out considerably to insure clear vision. The two 11-foot traffic lanes were paved with three inches of plant-mixed surfacing on six inches of untreated rock base. The five-foot shoulders consist of nine inches of untreated rock base and Class "C-Double" seal coat. Plant-mixed dikes and embankment protectors were installed to control drainage of the roadbed.

Sand Excavation

The Granite Construction Company was the general contractor on the Mt. Hermon contract. However, the earthwork and culvert installation

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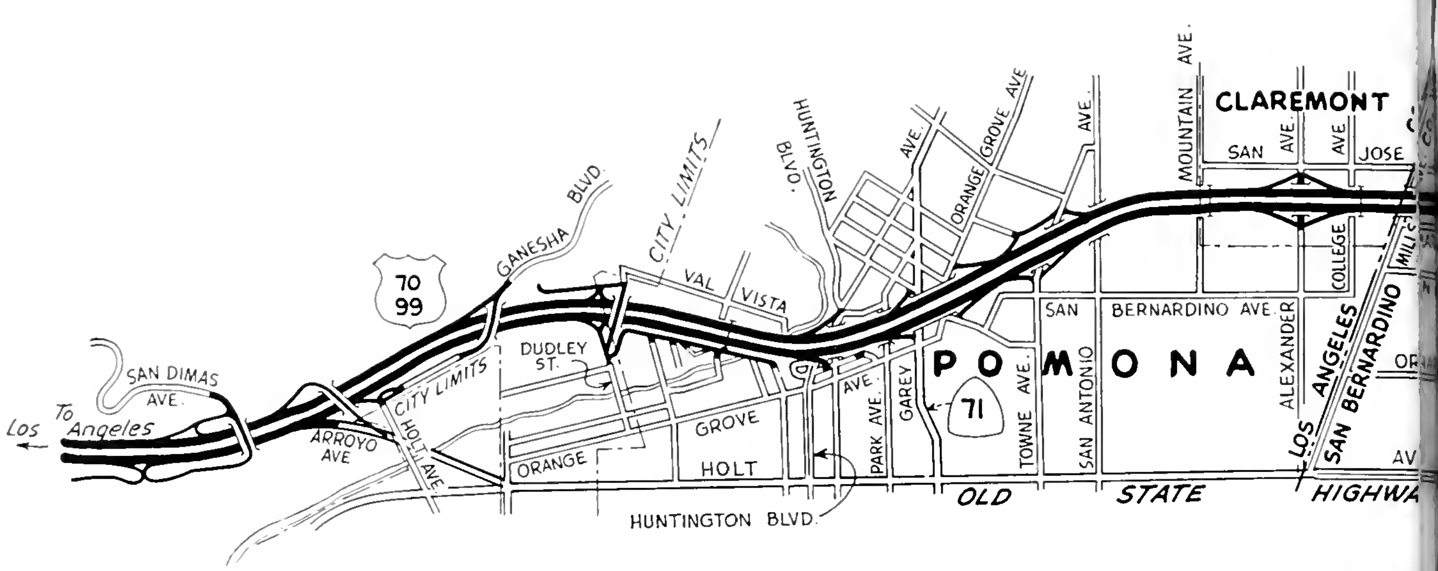


This map shows the 13.5-mile section of the Ramona-US 99 Freew

NEW FREEWAY

Continued from page 12 . . .

lane. The smallest day's run was 397 cubic yards.

Fifth Contract

The fifth construction contract to be advertised was for freeway construction between San Dimas Avenue west of Pomona to the San Bernardino-Los Angeles county line. The contract was awarded on May 21, 1953, to Guy F. Atkinson Co. The contract allotment was for $3,588,130. The resident engineer on this project was C. J. McCullough. The construction of bridges was under the supervision of L. E. Crayne, Bridge Department representative. The bridge work in this contract included the following:

1. San Dimas Ave. Overcrossing, a reinforced concrete box girder bridge, 111 feet long. Cost $53,600.
2. Route 77/26 Separation carried Route 77 over the freeway and was 162 feet long. Cost $70,000.
3. Ganesha Blvd. Overcrossing was a box girder type bridge, 154 feet long. Cost $100,000.
4. San Jose Wash Bridge was a box culvert type bridge, 510 feet long, and carried the wash under the freeway. Cost $158,700.
5. Three pedestrian undercrossings at Cleveland St., Mountain Ave. and College Ave. crossed under the freeway. Cost $37,700.

A requirement to be met by contractor was that public traffic should have access to Ganesha Boulevard three days prior to, during, and for three days after the Los Angeles County Fair. During 1953, traffic to the county fair was allowed to use all of the main roads into the fairgrounds and during 1954, traffic to the fair was allowed to use completed freeway facilities on the west end up to Ganesha Boulevard.

Kellogg Hills Excavation

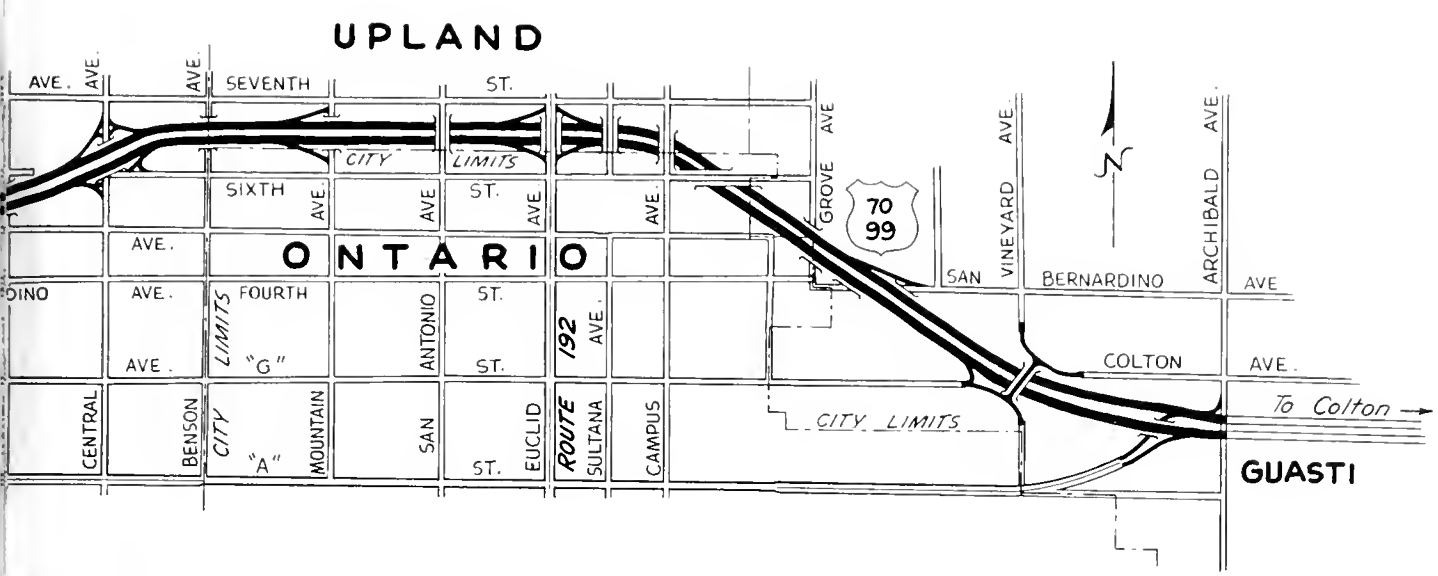
The roadway excavation in the Kellogg Hills area was moved by DW-20s, and rock cuts were removed by 3½-cubic-yard shovel and Euclid end-dump "off-the-road" equipment. Fills were compacted by sheepfoot rollers and 50-ton pneumatic rolling equipment. All equipment was routed over fill areas and material dumped on fill, then placed by dozer, so as to get full benefit of hauling equipment in compacting the roadbed.

The contractor had considerable trouble locating an imported borrow source that would keep his hauling equipment from the hazard of traveling city streets. Borrow was finally located in San Antonio Wash at the east end of the project. An agreement was worked out between the contractor and the San Bernardino County Flood Control, the Chino Basin Water District and U. S. Army Engineering Corps to use the borrow pit as a stilling basin for Mt. San Antonio Dam now under construction by Army engineers. Material was excavated by 1201 Lima and Bucyrus-Erie shovels using five-cubic-yard drag buckets. Also working in pit was a Northwest 80 with four-cubic-yard bucket. Material was hauled to job site in Schonrock cable operated trucks, Gar Wood telescoping hoist trucks and other large capacity trucking equipment. The contractor worked two 8-hour shifts on borrow, excavating and hauling, running as high as 35,000 tons per day. Rolling and compacting of borrow material was by standard equipment.

Portable Crushers Used

The contractor processed his imported base material from the same pit as was used to obtain borrow. Two portable crushers were set up and material crushed to specified size, elevated to bins and hauled to grade by truck. Material was spread to required thickness by spreader attached to tractor.

The top four inches of the imported base material was cement treated for subgrade for the portland cement concrete pavement. Material was sized into windrows, the cement then applied by a metered spreader and mixed through a Woods mixer. Material was then spread and cut to grade and rolled by tandem rollers and wobble wheel roller pulled by a watering



ngeles and San Bernardino Counties opened on November 16, 1954

truck. Asphaltic seal coat was then applied.

The pavement operation followed a day behind cement treatment. Pavement was placed by a dual drum paver, followed by Blaw-Knox spreader, finisher and Johnson float. The contractor turned out a maximum of 1,200 cubic yards per nine-hour shift. The joints were sawed by a late model Felker concrete saw. This saw was approximately 2,000 pounds lighter than old model and no trouble was caused by the machine leaving marks in new pavement. The 60-foot joints were cut, then machine dropped back to cut 15-foot joints. Very few cracks showed up following saw operation. Pavement was cured with Hunt process membrane.

The accommodation of public traffic did not present much of a problem as most of the job was on new alignment. Adequate flagmen were maintained at all city street crossings, and at major streets the contractor installed standard signal devices operated manually by off-duty City of Pomona policemen.

No major construction difficulties were encountered in the work once full operations were under way, and all contract work is expected to be finished shortly after the opening date.

The sixth construction contract on the freeway was for lights and signs in the Pomona-Claremont area. This contract was awarded to Ets-Hokin and Galvan, Inc., on July 23, 1953. The contract allotment was $177,500. The resident engineer was Ray DeGroff.

The seventh and final contract was awarded to Paul R. Gardner on October 14, 1953, for lights and illuminated signs through the District VIII portion. This contract carried an allotment of $73,317. The resident engineers were Paul Kirst and Arthur Nelson.

The total of the allotments for the seven contracts described above is close to $9,000,000, of which over $3,000,000 was for major bridge construction. Right of way acquisition cost for this 13.5-mile length totaled approximately $3,000,000. Thus the total cost of the freeway was $12,000,000, or about $900,000 per mile.

WHEN IN THE DARK

The habit of failing to replace the dash light bulb with a new one if the old bulb has burned out is likely to result in serious trouble for the driver, warns the National Automobile Club. When driving in the dark the operator is in the dark as to the exact speed he is traveling. He is likely to outdrive his headlights without knowing it, which means that he may be held up for speeding or caught in an accident. Besides, the ammeter or the oil pressure gauge could be registering various kinds of trouble and he would never know it until stranded.

Hal H. Hale of A.A.S.H.O. Resigns

After more than 10 years of service to the American Association of State Highways Officials as its executive secretary, Hal H. Hale has resigned, effective December 31st, to accept a new post with the Association of American Railroads.

Hale was appointed to the A. A. S. H. O. secretaryship on January 1, 1944. Since then he has been in the forefront of the nation-wide movement to obtain better highways, and has been active in the promotion of cooperation between the Federal Government and the various states.

He has also served as editor of *American Highways*, quarterly magazine of A. A. S. H. O. He has become intimately acquainted with highway problems in all states of the Union not only through his close contact with their highway officials but also through frequent personal visits to the states.

Hale is a graduate of the University of Tennessee. He became city engineer of Knoxville in 1933, a post he held for five years. Subsequently he was associated in engineering capacities with the Tennessee Valley Authority and the Portland Cement Association. In 1941 he joined the Washington staff of American Society of Civil Engineers, leaving A. S. C. E. in 1944 for his post with A. A. S. H. O.

LONG BEACH FREEWAY LINK OPENED BY GOVERNOR

The second major link of the Long Beach Freeway in Los Angeles County was officially opened for travel on Friday, October 29, 1954, by Governor Goodwin J. Knight.

what had been done and what was planned for the immediate future. He also spoke of the tremendous growth of California and the vital need for the freeway program to be continued.

Governor cuts ribbon. Front row, left to right: W. S. Grant, Assemblyman-elect, Long Beach; Governor Goodwin J. Knight; George Vermillion, Mayor of Long Beach; Burton Chace, Supervisor, Los Angeles County and former mayor of Long Beach. Immediately back of George Vermillion is Herbert Klocksiem, Assemblyman from the 44th District, and Robert E. McClure, member of California Highway Commission from Santa Monica.

Sponsored by the Long Beach Chamber of Commerce, the dedication ceremonies were held on the new freeway just south of the Atlantic Avenue separation structure.

Master of ceremonies was Lloyd C. Leedom, President of the Chamber of Commerce. George M. Vermillion, Mayor of Long Beach; George C. Rockafield, Chairman of the State and Federal Highway Committee of the chamber; Burton W. Chace, Supervisor for Los Angeles County and former Mayor of Long Beach; Herbert Klocksiem, State Assemblyman from the 44th District; Paul O. Harding, Assistant State Highway Engineer in charge of District VII; and Robert E. McClure, Member of the California Highway Commission from Santa Monica were the speakers. McClure had the pleasure of introducing Governor Knight who made the principal address of the day.

Governor Knight told of his interest in the entire highway program, of

Immediately following his remarks, the Governor stepped from the platform and posed for pictures and then cut the ribbon and officially led the caravan of cars over the new freeway to Long Beach.

A PLEASING LETTER

THE UNION METAL MANUFACTURING CO.
Canton 5, Ohio

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: Many publications cross my desk and, regretfully, one does not have the time to give all of them the attention they deserve. Yours is an exception.

There is something refreshing about *California Highways*. The format is pleasing, the type matter easy to read and the photographs are excellent. Congratulations! It's a job well done in reporting California's wonderful highway progress.

Sincerely yours,
A. S. FROMM
Advertising Manager

Mendocino Opens First Four-lane Highway in County

Sparked by the Mendocino County Chamber of Commerce, the first four-lane highway in that county was opened for travel to the motoring public the afternoon of October 31, 1954.

The new section of the Redwood Highway eliminates some bad grades and sharp curves that were on the old alignment. Built many, many years ago the old alignment did not take into consideration the marvelous growth of California nor the immense increase in the number of automobiles registered in our State.

The old alignment was 5.28 miles in length while the new road, between the same points, is 4.85 miles. This is a saving in distance of but 0.43 mile. But the saving in time is something else. As one speaker stated, the saving in distance is small but the saving in time is large.

Starting with a civic luncheon at the Brook Trails Lodge, in Willits, the celebration got off to a good start. Art Schilder of Okiah was master of ceremonies. The speeches were short and to the point. F. Walter Sandelin, Ukiah, member of the California Highway Commission, was the principal speaker at the luncheon. The interest of Governor Knight was apparent when Sandelin read a telegram from the Governor expressing his continued interest in the highway program and his regrets at not being able to be in attendance due to commitments in the southern part of the State.

Immediately after the luncheon the entire assemblage formed a caravan and proceeded to the new section of highway, being met there by hundreds of people from Mendocino County who were also interested in the opening of this new section of highway.

Speeches at the dedication ceremonies were also brief. With the help of Walter Sandelin and Alan Hart,

District Engineer for the Division of Highways from Eureka, a "cat skinner" hauled a log from the highway and the signal was given for the crowd to proceed over the new road.—*R. C. K.*

UPPER: The crowd on the highway at the dedication ceremony. LOWER: Lunch at Willits under auspices of Willits Chamber of Commerce. Back row, left to right: Alan S. Hart, District Engineer from Eureka; Harry Hoehl, Mayor of Willits; Leonard Nix, Mayor of Ukiah; Ray Archibold, Division Engineer, Bureau of Public Roads; Robert Farrell, President, Willits Chamber of Commerce; State Senator-elect James Busch. Front row, left to right: George Anderson, Director, Golden Gate Bridge District, Ukiah; T. Fred Bagshaw, Special Assistant to Director of Public Works; Art Schilder, master of ceremonies, Ukiah; Don Stanwood, President, Ukiah Chamber of Commerce; F. Walter Sandelin, member, California Highway Commission, Ukiah; State Senator Bert Busch, Ukiah; E. Safford, Supervisor, Mendocino County, Willits. The 14th man at the head table took the picture.

Promotions

Milton Harris, Frank Baxter and Walter Nett Are Given New Jobs

PROMOTION of Milton Harris to the position of Construction Engineer for the California Division of Highways to succeed Don G. Evans, retired, was announced by State Highway Engineer G. T. McCoy.

FRANK E. BAXTER

To replace Harris as district engineer of District IX, with headquarters in Bishop, McCoy promoted Frank E. Baxter, who has been assistant district engineer of District II, with headquarters in Redding.

Baxter's post in Redding was filled by Walter M. Nett, who for the past year has been assistant construction engineer for the division, working out of Sacramento headquarters.

Graduated From Oregon State

Harris has been district engineer of District XI, covering Inyo, Mono, and the eastern part of Kern Counties, since February, 1953. Before that he was service and supply engineer for the division, a post he assumed after

MILTON HARRIS

his return from World War II military service with the Army Engineers and the Allied Military Government in Italy.

He is a native of Oregon, and received his degree in civil engineering from Oregon State College in 1917. He served in World War I and then entered engineering work, joining the Division of Highways staff in 1928 as an instrument man in the Eureka district. Subsequently he served in Bishop and the Sacramento headquarters office.

As service and supply engineer prior to 1953, Harris had full charge of procedures for procurement, warehousing and distribution of materials and supplies used by the Division of Highways.

Baxter Goes to Bishop

Baxter, the new district engineer of District IX, is a native of Los Angeles, an engineering graduate of the University of California, and an employee of the Division of Highways since 1930.

Until April, 1951, when he was transferred to Redding, his highway work was in the San Joaquin Valley and adjoining mountain areas. Working out of the District VI headquarters at Fresno, Baxter served as dis-

WALTER M. NETT

trict materials engineer, district office engineer, and district maintenance engineer.

As assistant district engineer of District II, Baxter has been in general charge of construction and maintenance of state highways in Siskiyou, Modoc, Lassen, Shasta, Plumas, and Tehama Counties and the eastern part of Trinity County.

Nett, in assuming Baxter's post at Redding, is returning to a district where he served as district construction engineer between January, 1952, and September, 1953. Prior to that, his career with the division had been in the Fresno district, starting in 1930. He served in the Seabees in World War II.

Don G. Evans

Retirement of Don G. Evans, construction engineer for the California Division of Highways, marking the end of 25 years of state service, was announced on November 6th.

Evans came to work for the division in 1929 as location engineer and later as construction superintendent in District VII at Los Angeles.

DON G. EVANS

As construction engineer for the division, a post he has held for the past three and a half years, Evans' scope of supervision of highway construction has been state-wide, covering hundreds of projects, large and small, along the 14,000-mile State Highway System.

Previously, he had served as assistant district engineer-operations for District VI, with headquarters at Fresno, a post in which he had direct supervision of all construction and maintenance work on state highways in Madera, Fresno, Kings, Tulare, and Kern Counties.

Born in Indiana

Evans was born in Terre Haute, Indiana, in 1890, where he attended public schools and the Rose Polytechnic Institute, receiving his bachelor of science degree in engineering in 1911. He later took a postgraduate engineering course at the Colorado School of Mines.

Between 1912 and 1919 he worked as an engineer on various mining jobs in Colorado, Arizona and Central America, including two years as construction engineer for the United Verde Copper Company in Arizona.

In 1920 he was employed by the U. S. Bureau of Public Roads and for the next nine years served as resident engineer, chief locator and finally chief of forest and park roads in Arizona and New Mexico.

Evans' pre-World War II experience with the Division of Highways includes five years as location engineer for District VI in Fresno and another five years as resident engineer during which he supervised the construction of many highway projects in the Bakersfield area.

At the outbreak of World War II Evans joined the U. S. Corps of Engineers. He held the rank of colonel when he left active military service in 1946 to resume his career with the State of California. He is a member of the American Society of Military Engineers.

Evans and his wife will live in Los Angeles, from where they plan to make extensive trips throughout the United States. During the next two years they hope to visit every state in the Union.

BURNS MEMORIAL FREEWAY REDEDICATED

At dedication, left to right: Ray Bradbury, Humboldt County Chamber of Commerce; Mrs. O. A. Moore, daughter of Mrs. Burns; George Cole, President, Humboldt County Chamber of Commerce; Mrs. Michael J. Burns; Alan S. Hart, District Engineer, District I; Richard Denbo, Secretary, Humboldt County Chamber of Commerce; Mrs. Sophie Benson, sister of Mrs. Burns; Cliff Dumm, President, Eureka Chamber of Commerce

At a brief roadside ceremony on October 18th, the Humboldt County Chamber of Commerce rededicated the first unit of the Michael J. Burns Memorial Freeway to the memory of the man who was co-sponsor of the revolutionary highway financing legislation known as the 1947 Collier-Burns Highway Act.

Humboldt County's beloved Senator Mike Burns passed away on May 1, 1949. By House Resolution No. 230 on June 15, 1949, the State Legislature named the proposed freeway, which was yet to be built, from the north city limits of Eureka to the north city limits of Arcata, the Michael Burns Memorial Freeway.

The first unit of this four-lane divided freeway was opened to traffic on July 20, 1954, which unit extended from Gannon Slough, south of Arcata, to a point just north of the north city limits of Arcata. The second and last unit of the Burns Freeway extends from the north city limits of Eureka to Gannon Slough. The grading for this unit is complete and the base and surfacing will be placed during the summer season of 1955.

To give form and substance to the Burns Freeway, official signs so designating this fact were purchased and installed by the Division of Highways. The sign facing northbound traffic at Gannon Slough will be repositioned to a point near the north city limits of Eureka and facing northbound traffic next fall when the last unit of the Burns Freeway is completed.

The rededication on October 18th was handled by the Humboldt County Chamber of Commerce with President George Cole, of Eureka, in charge. Mrs. Michael J. Burns, wife of the late Senator, was introduced to the group by Cole.

US 50 Project

Open New Four-lane Divided Expressway in San Joaquin County

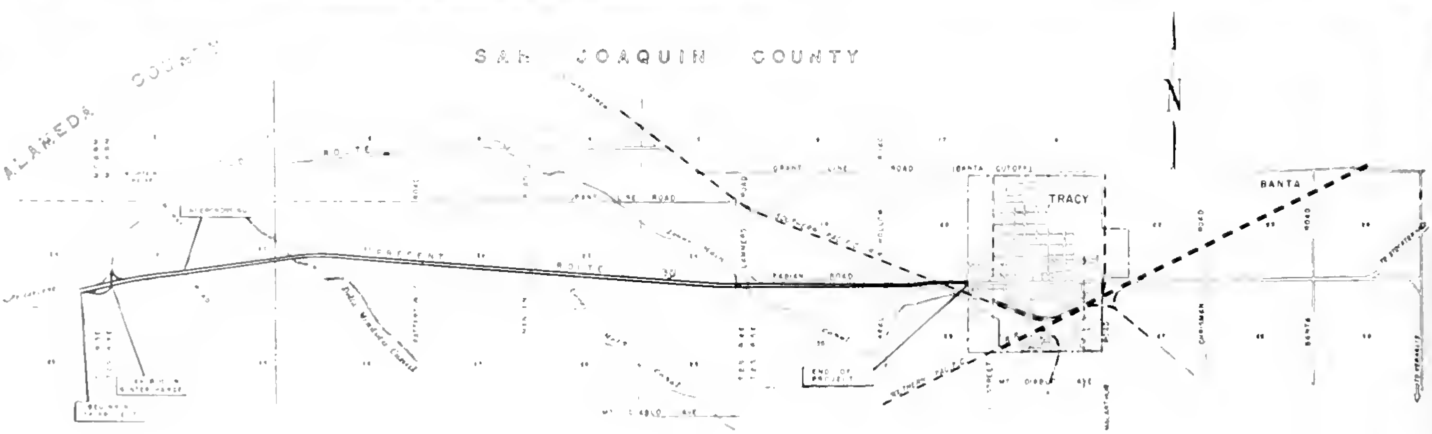
By FRANCIS O'NEILL, District Planning Engineer

The new four-lane expressway between the Altamont Pass Road in Alameda County and the west city limits of Tracy was opened to traffic during November. This road has been under construction since September, 1952, when the first contract for rough grading and structures was awarded to McCammon-Wunderlich Co. and C. K. Moseman of Palo Alto. A second contract with Gordon H. Ball, San Ramon Valley Land Co., and Clements and Co. was approved June 30, 1954, to provide for completion of the project by construction of connections at each end and surfacing with portland cement concrete pavement.

Old Two-lane Route

The old two-lane route is approximately 9.5 miles in length, with numerous curves and steep grades at the westerly end. The steep grades, narrow pavement and restricted sight distance caused considerable inconvenience to the motoring public because of the difficulty that trucks and trailers encountered in negotiating this portion of the old facility. The average daily traffic on this road is 11,300 vehicles, 12.5 percent of which are

This photo shows typical traffic slow-up on old Altamont Pass-Tracy Highway



trucks. Week-end and holiday traffic moved "bumper to bumper" in both directions. Many accidents occurred due to attempted passing without sufficient sight distance.

The new route is 8.4 miles in length on smooth alignment and grades and provides two lanes in each direction with adequate shoulders for emergency parking.

Interchange and Separation

An interchange was constructed at the west end of the project connecting to the old Altamont Pass Route and Mountain House. A separation is provided at Midway Road with no connections to the freeway at this location. Channelized intersections at grade have been constructed at Patterson Pass Road, Hansen Road, Lammers Road and Corral Hollow Road. Adequate rights of way were acquired for the future construction of interchanges at these locations so as to develop this road ultimately to a full freeway.

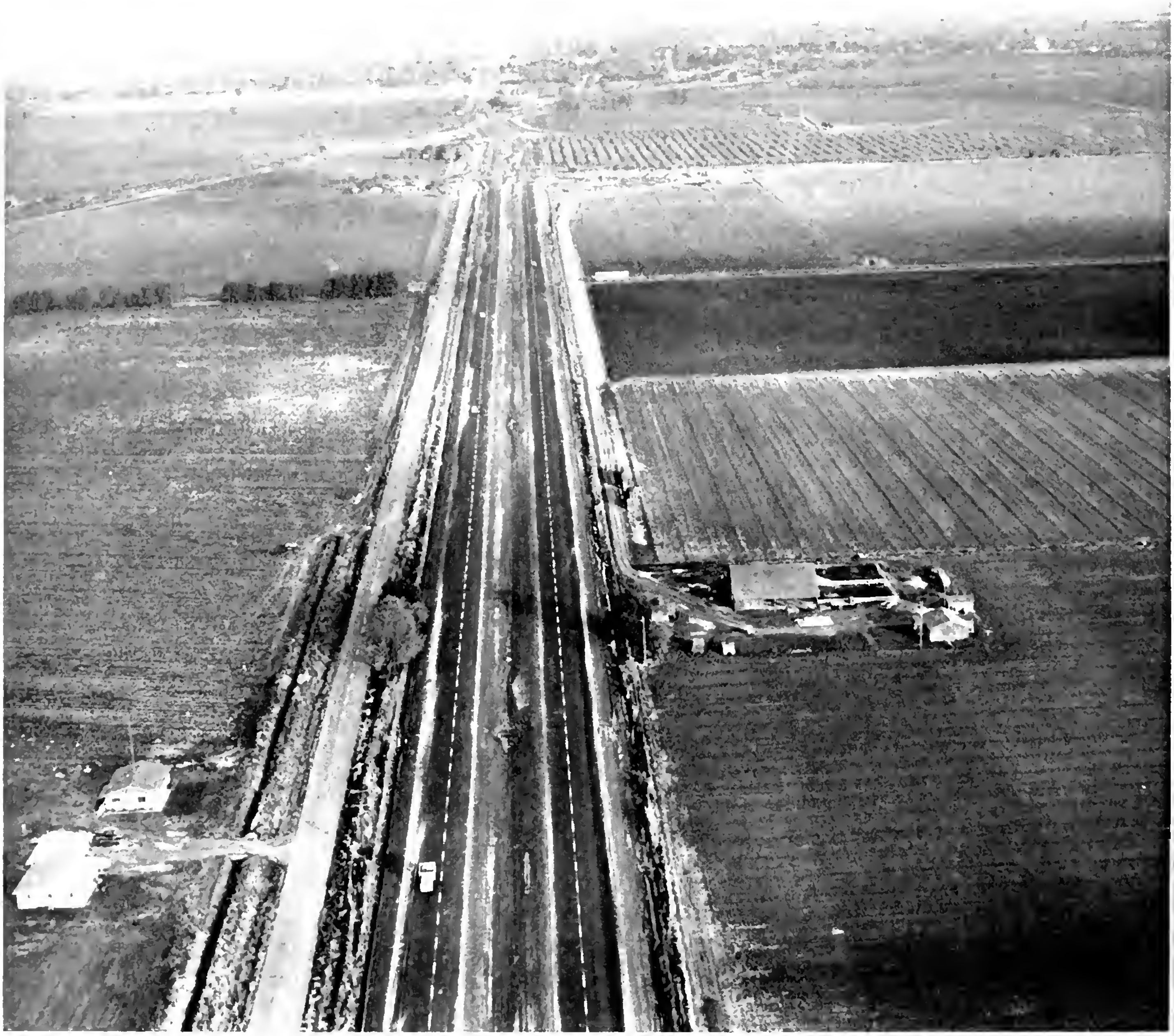
The Southern Pacific Railroad tracks, west of Tracy, are crossed at grade with automatic crossing gates provided for traffic safety and protection.

Fabian Road, paralleling the expressway to the north between Lammers Road and Corral Hollow Road, is utilized as a frontage road to provide traffic circulation for abutting property owners.

Rapid Paving

One of the outstanding construction features of the second contract was the speed at which the portland cement concrete pavement was placed. An average of 1,090 cubic yards of portland cement concrete placed per day was maintained throughout the concrete paving of the project. This rapid paving schedule enabled the contractor to complete the placing of plant mixed surfacing on the shoulders and road connections during favorable weather. This work would otherwise have had to be delayed until next year. The project engineer for

New Altamont-Tracy Expressway. UPPER: Mountain House interchange looking east. LOWER: Expressway crosses Delta-Mendota Canal, on right.



This aerial of Altamont Pass Tracy Freeway is looking east toward Tracy

the paving contractor was J. W. Vickrey, Jr.

The old road, which will be reverted to Alameda and San Joaquin Counties, has been resurfaced in part to present a smooth riding pavement.

The first contract was constructed under the state supervision of Resident Engineer L. L. Craun and the second under Resident Engineer H. Atherstone.

TEN SECONDS TO PASS

It takes about 10 seconds to pass another moving automobile, says the California State Automobile Association, which adds that at 60 miles an hour your car will travel 880 feet in that time. If another car is approaching at equal speed, the distance required for you to pass safely is 1,760 feet, to which a margin should be added for safety.

DRIVERS' LICENSES

Californians had a total of 6,144,126 drivers' licenses as of August 31, 1954. Of this total, 5,667,488 were operators' licenses and 476,638 were chauffeurs' licenses.

HIGHWAY USERS PAY BIG TAX BILL

Highway users in the United States pay 6 billion dollars per year in special automotive taxes.

New Budget

Highway Commission Allocates Total of $291,739,600 for 1955-56 Fiscal Year

The California Highway Commission's budget providing $198,266,000 for major construction purposes on state highways for the fiscal year beginning July 1, 1955, was made public today by Governor Goodwin J. Knight.

In transmitting the budget to Governor Knight, the Highway Commission pointed out that the estimated revenue from state taxes for the 1955-56 budget had to be based on the reduced highway user taxes which are slated to go into effect on July 1, 1955. The 1953 legislation which made possible the present accelerated construction program provides that on next July 1st the taxes on gasoline and diesel fuel will be reduced one-half cent per gallon, with proportionate decreases in other highway user taxes.

Plans Will Be Ready

The commission said, however, that plans for other urgently needed construction projects will be ready in the event that the present level of highway revenues is retained by the Legislature after July 1, 1955. It is estimated that in that case the additional amount available for major state highway improvements next year would be $25,000,000.

The over-all budget total, including certain allocations to cities and counties, is $291,739,600. Of the $198,266,000 scheduled for major construction purposes on state highways, $122,018,000 is allocated for construction projects and $76,248,000 for rights of way for future highway improvement.

Comparable figures for the 1954-55 budget adopted in November, 1953, include: over-all budget, $298,998,830; major state highway construction purposes, $205,110,000.

The balance of the 1955-56 budget, $93,473,600, provides $58,950,000 for other state highway expenditures, plus $25,416,000 state funds to cities for city streets, $6,530,000 federal aid secondary funds for county roads, $2,500,000 state funds to counties to assist the required matching of federal aid secondary funds and $77,600 for outdoor advertising supervision.

Start of Major Projects

State Director of Public Works Frank B. Durkee, ex officio Chairman of the Highway Commission, pointed out that this budget signals the start of many major developments on highway routes and in areas where deficiencies have long been recognized. He said also that the 1955-56 budget provides for the completion of many urban freeway projects, extension of multilane intercity freeways and expressways, construction of new bridges and straightening, widening, and surfacing on many rural routes.

A conception of the highway improvements which will be accomplished by the expenditures from this budget can be gained from these facts: the major construction projects affect more than 400 miles of state highways; the right-of-way allocations affect many additional miles; a total of 40 bridges across streams and 133 other structures including highway separations and railroad separations will be constructed; 65 miles of the proposed improvements involve full freeways, which will bring California's total of full freeways to a new high of 388 miles. The proposed 64 miles of expressway construction (with some intersections at grade) will increase the mileage of multilane divided highways to 1,639, a toll-free mileage of that type far in excess of the total in any other state.

Budget Items

The fiscal year covered by the new budget does not begin until next July but a number of the projects will be advertised for bids beginning in January, 1955. State law permits the awarding of contracts on or after April 1st, three months before the actual start of the fiscal year, so that full advantage may be taken of favorable construction weather.

The state highway items in the budget are as follows:

Major construction projects, $110,018,000; construction engineering, $12,000,000; rights of way, $76,248,000; maintenance $23,000,000; contingencies, $4,925,000; preliminary engineering, $15,000,000; administration, $6,575,000; buildings and plants, $4,500,000; state-wide highway planning, $2,000,000; honor camps, $1,500,000; maintenance of the San Francisco-Oakland Bay Bridge, $1,200,000; and minor improvement and betterment, $250,000.

The largest single item in the construction portion of the budget is $7,015,000 for an eight-lane section of the Eastshore Freeway in the City of Oakland, between 10th Street and the distribution structure. The next largest is $4,600,000 for extension of the Harbor Freeway in Los Angeles from Gage Avenue to 88th Street.

Rights of Way

Among the budget allocations for acquisition of rights of way on major freeway routes are:

In Northern California, $2,000,000 for the Embarcadero Freeway and $5,100,000 for the US 101 freeway connection from the Bayshore Freeway to Turk Street, both in San Francisco; $1,700,000 for the Bayshore Freeway between San Carlos and the Santa Clara county line; $1,250,000 for Sign Route 24 in the Walnut Creek area of Contra Costa County; $650,000 for US 101 in Marin County between Waldo and north of Greenbrae and $800,000 for the South Sacramento Freeway on US 50-99. (With $750,000 additional 1954-55 funds allocated October 21st this brings the total right of way allocation to more than $2,500,000 for the South Sacramento Freeway.)

In Southern California

In the Los Angeles metropolitan area, $14,650,000 for the Golden State Freeway (US 6-99); $5,000,000 for the Ventura Freeway (US 101) and $3,000,000 for the Hollywood Free-

. . . Continued on page 45

Construction Projects in State Highway Budget

County	Route	Description	Approximate mileage	Estimated cost
Alameda	69 (SR 17)	Eastshore Freeway—Beard Rd. to Jackson St. (Route 105); grade, pave and structures for 4-lane freeway	5.6	$4,500,000
Alameda	69 (SR 17)	Eastshore Freeway, 10th St. in Oakland to Distribution Structure; grade, pave and structures for 8-lane freeway	1.4	7,015,000
Alameda, Contra Costa	107 (SR 21)	US 50 to 0.2 mile north of Alameda-Contra Costa county line; grade, surface and structure—some realignment	2.0	700,000
Alameda	227	Mountain Blvd., from US 50 to SR 24; (portions); grade and surface for 4- and 6-lane freeway (State's share)	9±	300,000
Alameda	Various	Rights of way on state highway routes		2,192,000
Amador	Various	Rights of way on state highway routes		109,200
Butte	3 (US 99E)	Fagan to vicinity of Biggs Rd. (portions); base and surface—widening	3.3	200,000
Butte	87	4 miles to 9.5 miles north of Oroville; three bridges and approaches		118,000
Butte	Various	Rights of way on state highway routes		125,000
Calaveras	24 (SR 4)	At Avery; drainage correction		30,000
Calaveras	65 (SR 49)	Angeles Camp to Tuolumne county line; grade and surface (widening)	6.5	100,000
Calaveras	Various	Rights of way on state highway routes		95,000
Colusa	7 (US 99W)	Through Arbuckle; grade, surface and structure for 4-lane expressway	1.5	750,000
Colusa	Various	Rights of way on state highway routes		20,000
Contra Costa	75 (SR 24)	West of Sunnybrook Dr. to west of Pleasant Hill Rd. (portions); grade, pave and structures for 6- and 8-lane freeway	2.6	3,800,000
Contra Costa	75 (SR 24)	West of Pleasant Hill Rd. to east of Pleasant Hill Rd.; grade, pave and structures for 6- and 8-lane freeway	1.3	1,500,000
Contra Costa	75 (SR 21 and 24)	Near north city limits of Walnut Creek to 0.3 miles north of Monument; grade, pave and structures for 4-lane freeway	2.8	3,580,000
Contra Costa	107 (SR 21)	Danville to 0.7 mile north of south city limits of Walnut Creek (portions); reconstruct	4.4	285,000
Contra Costa, Alameda	107 (SR 21)	US 50 to 0.2 mile north of Alameda-Contra Costa county line; grade, surface and structure—some realignment	2.0	*700,000
Contra Costa	Various	Rights of way on state highway routes		1,958,000
Del Norte	1, 71 (US 101)	US 199 to Smith River Bridge; surface on relocation (grading now under way)	6.2	500,000
Del Norte	71 (US 101)	Winton Corners to Oregon state line; reconstruct	5.5	255,000
Del Norte	Various	Rights of way on state highway routes		80,000
El Dorado	11 (US 50)	Through Placerville; surface, lights and signals to complete 4-lane expressway	1.5	490,000
El Dorado	Various	Rights of way on state highway routes		100,000
Fresno	4 (US 99)	San Joaquin St. to West Ave. (portions); grade, pave and structures for 6-lane freeway	1.6	2,250,000
Fresno	41 (SR 180)	O and P Sts. from Stanislaus St. to Ventura Ave., (one way); resurface and signals		135,000
Fresno	Various	Rights of way on state highway routes		489,000
Humboldt	1 (US 101)	16th St. in Fortuna to north city limits; surface	1.0	30,000
Humboldt	1 (US 101)	South city limits of Eureka to 0.6 mile north of north city limits; grade, surface and structure (widening and additional Eureka Slough bridge)	4.5	900,000
Humboldt	1 (US 101)	North city limits of Eureka to Gannon Slough; surface (expressway under construction)	5.0	850,000
Humboldt	1, 20 (US 101 and 299)	0.9 mile north of Plaza Ave. to Mad River Bridge and US 299 intersection (portions); structures and approaches (for interchange)	2.2	448,000
Humboldt	35 (SR 36)	Cummings (Fox) Creek, bridge and approaches	0.4	70,000
Humboldt	Various	Rights of way on state highway routes		520,000
Imperial	12 (US 80)	Coyote Wells Underpass, junction of Rt. 202; grade, pave and structure for widening highway		400,000
Imperial	12 (US 80)	Dahlia Canal to US 99; grade and pave for 4-lane highway	0.5	95,000
Imperial	27, 187 (US 80)	Alamo River to 0.3 mile east of Holtville and in City of Holtville; grade, pave and channelize (widening)	1.3	165,000
Imperial	201	Rt. 187 to 0.5 mile north; grade and pave (reconstruct and widen)	0.5	60,000
Imperial	Various	Rights of way on state highway routes		243,000
Inyo	Various	Rights of way on state highway routes		12,000
Kern	4 (US 99)	Fort Tejon to 0.5 mile north of Grapevine Station; reconstruct (portions)	4.7	400,000
Kern	4 (US 99)	1.4 miles north of Grapevine to 0.6 mile south of McKittrick Rd; grade and surface (convert divided highway to expressway with limited access)	17.7	200,000
Kern	4 (US 99 and 399)	Union Ave. Underpass; grade, pave and structure (widen to 6-lane divided)	0.3	450,000
Kern	4, 142 (US 99 and 466)	Garces Circle Interchange; grade, pave and structure		1,500,000
Kern	57 (SR 178)	2.0 miles west of Democrat Hot Springs to Democrat Hot Springs; grade and surface (widen and some realignment)	2.0	80,000
Kern	23 (US 6)	Kern-Los Angeles county line to 8.0 miles south of Mojave; surface	8.4	125,000
Kern	23, 58 (US 6 and 466)	0.5 mile north of Mojave to Boron (portions); grade and surface (some widening over crests; channelization at junction north of Mojave)	23±	430,000
Kern	Various	Rights of way on state highway routes		1,192,000
Kings	125 (SR 41)	South Fork of Kings River; bridge and approaches		108,000
Kings	Various	Rights of way on state highway routes		20,000
Lake	15 (SR 20)	Laurel Dell Lake to Tule Lake (portions); grade and surface (realignment)	2.5	625,000
Lake	49 (SR 53)	Long Valley Creek Bridge and Guenoc Cattlepass; structures		30,000
Lake	Various	Rights of way on state highway routes		100,000

SR—State Sign Route

for 1955-56 Fiscal Year Total $198,266,000

County	Route	Description	Approximate mileage	Estimated cost
Lassen	Various	Rights of way on state highway routes		$30,000
Los Angeles	2	Whittier Blvd.-Painter Ave. to Washington Blvd.; grade, pave and structures (widen)	0.6	350,000
Los Angeles	4, 161 (US 6-99)	Golden State Freeway-Glendale Blvd. to 0.5 mile north of Los Feliz Blvd. (portions); structures for Los Feliz Blvd. interchange		1,300,000
Los Angeles	4, 161 (US 6-99, SR 134)	Golden State Freeway-0.5 mile north of Los Feliz Blvd. to University Ave., (portions); bridge over Los Angeles River near Victory Blvd.		2,600,000
Los Angeles	9 (SR 118)	Foothill Blvd.-Tujunga Canyon Blvd. to Alta Canyada Rd.; grade, pave and structures (widen)	4.7	600,000
Los Angeles	9 (SR 118)	Canada Ave.-Montana St. to Lincoln Ave. in Pasadena; reconstruct	0.6	95,000
Los Angeles	19 (SR 71)	Pearl St. in Pomona to US 66 (portions); grade, pave and structures (widen)	3.1	600,000
Los Angeles	23 (US 6)	Palmdale to Lancaster (portions); grade and shoulders	6.4	30,000
Los Angeles	61 (SR 2)	Near Glendale Ave. to Town St.; grade, surface, signals and illumination (widen)	0.8	250,000
Los Angeles	156 (SR 27)	Topanga Canyon Rd., 0.2 mile north of US 101 Alternate to 2.9 miles north of Los Angeles city limits, (portions); grade and surface (some realignment)	0.7	110,000
Los Angeles	165 (US 6 and SR 11)	Harbor Freeway-88th St. to Gage Ave.; grade, pave and structures for 8-lane freeway	1.8±	4,600,000
Los Angeles	167 (SR 15)	Los Angeles River (Long Beach) Freeway-0.2 mile south of Rosecrans Ave. to Southern Ave. (portions); grade, pave and structures for 6-lane freeway	3.3	1,820,000
Los Angeles	167 (SR 15)	Los Angeles River (Long Beach) Freeway-Southern Ave. to north junction Atlantic Blvd. (portions); structures and approaches for 6-lane freeway	3.8	2,868,000
Los Angeles	167 (SR 15)	Los Angeles River (Long Beach) Freeway-north junction Atlantic Blvd. to east 26th St.; grade, pave and structures for 6-lane freeway	0.2	1,700,000
Los Angeles	170 (SR 35)	Workman Mill Rd.-Pioneer Blvd. to San Jose Creek; grade, surface and structures (some realignment and drainage improvement)	1.5	82,000
Los Angeles	173 (SR 26)	Ninth St. Viaduct (Los Angeles River); bridge railing		50,000
Los Angeles, Orange	174 (US 101, SR 14)	Santa Ana Freeway-Coyote Creek to Orangethorpe Ave.; grade, pave and structures (incl. Buena Park realignment)	2.0	2,100,000
Los Angeles	178 (US 91 and SR 18)	Carson St.-San Gabriel River to Orange county line; grade, pave and structures (widen to 4 lanes divided)	1.8	300,000
Los Angeles	Various	Rights of way on state highway routes		36,992,000
Madera	4 (US 99)	0.5 mile south to 1.5 miles north of Madera (portions); irrigation and relocation	3.6	30,000
Madera	Various	Rights of way on state highway routes		521,000
Marin	1 (US 101)	Waldo to 0.3 mile north of Alto intersection (portions); grade, pave and structure for 6-lane freeway, including Alto interchange	2.5	1,730,000
Marin	Various	Rights of way on state highway routes		715,000
Mendocino	48 (SR 128)	8.75 miles to 15.25 miles easterly of Boonville (portions); reconstruct	6.4	130,000
Mendocino	48 (SR 128)	Flynn Creek; bridge and approaches		80,000
Mendocino	56 (SR 1)	0.7 mile south to 0.2 mile north of Greenwood Creek; grade, surface and structures (replace bridge, improve approaches)	0.9	475,000
Mendocino	56 (SR 1)	Little River; temporary bridge and approaches	0.1	55,000
Mendocino	Various	Rights of way on state highway routes		255,000
Merced	122 (SR 140)	East Side Canal; bridge and approaches		100,000
Merced	123	Sign Rt. 152 to Merced (portions); widen 11 bridges	7±	220,000
Merced	Various	Rights of way on state highway routes		80,000
Modoc	Various	Rights of way on state highway routes		20,000
Mono	40	Pole Line Rd.-US 395 to Nevada state line (portions); grade and surface (widen)	10±	200,000
Monterey	2 (US 101)	Canal St. (King City) to 1.8 miles north of Salinas River; grade, surface and structure (4-lane expressway and additional bridge)	2.8	1,366,000
Monterey	117 (SR 1)	Camino El Estero to Del Monte Junction; grade, surface and structure for 4-lane expressway	1.2	410,000
Monterey	Various	Rights of way on state highway routes		340,000
Napa	6 (SR 37)	East city limits of Napa to 6.5 miles east (portions); grade and surface (widen, some realignment)	1.2	75,000
Napa	Various	Rights of way on state highway routes		210,000
Nevada	38 (US 40)	East Truckee to Boca (portions); reconstruct	5.5	125,000
Nevada	Various	Rights of way on state highway routes		210,000
Orange	62 (SR 39)	Imperial Highway to Whittier Blvd. west of La Habra; grade, surface and structures (widen)	1.6	200,000
Orange, Los Angeles	174 (US 101 and SR 14)	Santa Ana Freeway-Coyote Creek to Orangethorpe Ave.; grade, pave and structures (including Buena Park realignment)	2.0	2,100,000
Orange	174 (US 101)	Santa Ana Freeway-La Palma Ave.-Brookhurst St. interchange		1,070,000
Orange	174 (US 101)	0.2 mile west of Euclid Ave. in Anaheim to 0.2 mile east of South St. and Ball Rd. interchange; grade, pave and structures (realignment through Anaheim)	1.7	2,332,000
Orange	Various	Rights of way on state highway routes		2,430,000
Placer	17, 37 (US 40)	1.0 mile east of Newcastle to Elm St. in Auburn; structures for 4-lane freeway	2.7	900,000
Placer	38 (SR 89)	2.8 miles north of Tahoe City to Truckee River Bridge; reconstruct	2.1	70,000
Placer	Various	Rights of way on state highway routes		200,000
Plumas	21 (US 40 Alt)	In Portola; drainage correction		50,000
Plumas	83 (SR 89)	Middle Fork Feather River Bridge and line change; grade, surface and structure	1.0	280,000
Plumas	83 (SR 89)	In Greenville; drainage correction and surfacing	0.5	30,000

SR = State Sign Route

County	Route	Description	Approximate mileage	Estimated cost
Plumas	83 (SR 89)	Westwood Rd. to Almanor Dam; grade and surface (realignment)	0.7	$70,000
Plumas	Various	Rights of way on state highway routes		24,000
Riverside	26 (US 60-70-99)	22d St. in Banning to 0.7 mile east of Banning; grade, pave and structures for 4-lane freeway (some structures under contract)	3.5	1,350,000
Riverside	26 (US 60-70-99)	West city limits of Indio to 0.5 mile north of the Indio Overhead; grade, pave and structures (widen to 4-lanes divided)	2.6	820,000
Riverside	43 (US 91-395 and SR 18)	In Riverside, 0.4 mile south of 14th St. to Russell St.; grade, pave and structures for 4-lane freeway	2.2	2,100,000
Riverside	187 (SR 111)	In Palm Springs, Palo Verde Ave. to Ramon Rd.; grade, surface and structure (widen)	1.3	180,000
Riverside	Various	Rights of way on state highway routes		1,290,000
Sacramento	4 (US 50-99)	San Joaquin county line to 1.5 miles south of Cosumnes River; grade, surface and structures for 4-lane freeway	6.8	3,600,000
Sacramento	11 (US 50)	Mills to 1.0 mile west of Nimbus; surface	4.9	75,000
Sacramento	Various	Rights of way on state highway routes		1,205,000
San Benito	Various	Rights of way on state highway routes		80,000
San Bernardino	26, 43 (US 70-99)	Warm Creek to south E St. and Rt. 26 to Santa Ana River; grade, pave and structures for 4-lane freeway (including Santa Ana River Bridge)	1.3	1,785,000
San Bernardino	31 (US 66-91-395)	Near Verdemont to 0.6 mile north of Devore; grade and surface (widen existing highway)	2.1	85,000
San Bernardino	31, 190 (US 66-91-395 and SR 30)	Highland Ave. separation and overhead; grade, pave and structures for north-south freeway	0.4	1,100,000
San Bernardino	190 (SR 30)	Riverside Ave. to US 66-91-395 in San Bernardino; grade and surface (widen)	3.3	325,000
San Bernardino	Various	Rights of way on state highway routes		3,190,000
San Diego	2 (US 101)	Laurel St. to San Diego River; cooperative drainage		250,000
San Diego	2 (US 101)	At Cudahy Creek; grade and pave		130,000
San Diego	12 (US 80)	Fairmount Ave. to El Cajon Blvd. (portions); grade, pave and structures for converting expressway to full freeway	4.5	400,000
San Diego	12 (US 80)	Jackson St. separation; structure for converting expressway to full freeway		260,000
San Diego	77 (US 395)	Fulton St. to Aero Dr. (portions); grade, pave and structures (separation of intersections)		823,000
San Diego	195 (SR 76)	In Oceanside, Loma Alta Canyon Dr. to Mesa Dr., grade and pave (widen to 4 lanes divided)	0.5	70,000
San Diego	198 (SR 67)	Main St. in El Cajon to 0.3 mile north of Broadway; grade and pave (widening, signals and channelization)	1.2	290,000
San Diego	200 (SR 94)	College Ave. to Campo Rd.; grade, pave and structures for 4-lane freeway	2.5	3,480,000
San Diego	Various	Rights of way on state highway routes		3,026,800
San Francisco	56 (SR 1)	Fulton St. to Lake St.; grade and surface (widen to 6-lane expressway)	0.9	200,000
San Francisco	224	Embarcadero Freeway—San Francisco-Oakland Bay Bridge at Fremont St. to Broadway (portions); grade, pave and structures	1.2±	2,600,000
San Francisco	Various	Rights of way on state highway routes		7,150,000
San Joaquin	4 (US 99)	Lathrop Rd. to Turner Station; grade, surface and structures for 4-lane freeway	4.8	1,400,000
San Joaquin	24 (SR 12)	1.2 miles east of Clements to Calaveras county line; grade and surface (realignment)	4.4	400,000
San Joaquin	Various	Rights of way on state highway routes		750,000
San Luis Obispo	56 (SR 1)	Morro Creek; bridge		25,000
San Luis Obispo	Various	Rights of way on state highway routes		835,000
San Mateo, Santa Clara	2 (US 101)	El Camino Real, 0.1 mile north of University Ave. to 0.1 mile north of the Santa Clara-San Mateo county line; grade and surface (widen)	0.5	240,000
San Mateo	2 (US 101)	El Camino Real, Rosedale Ave. to Victoria Ave.; grade and surface (widen)	0.9	300,000
San Mateo	56 (SR 1)	0.3 mile north of Finney Creek to Lake Lucerne (portions); grade and surface (widen and some realignment) (Joint Highway Dist. No. 9)	11.1	150,000 (State's share)
San Mateo	68 (US 101 Bypass)	Bayshore Freeway-Willow Rd. interchange; structure		930,000
San Mateo	68 (US 101 Bypass)	Bayshore Freeway 0.3 mile north of Butler Rd. to San Francisco county line (portions); grade and structure for 6-lane relocation across Candlestick Cove	3.5	2,000,000
San Mateo	68 (US 101 Bypass)	Bayshore Highway in Burlingame and Millbrae (portions); drainage		120,000
San Mateo	Various	Rights of way on state highway routes		1,775,000
Santa Barbara	2 (US 101)	Los Olivos St. (Santa Barbara) to El Sueno Rd; grade, pave and structures for 4-lane expressway	3.2	2,200,000
Santa Barbara	2 (US 101)	0.5 mile west of Arroyo Hondo to Gaviota; grade and surface for 4-lane expressway	3.4	850,000
Santa Barbara	2 (US 101)	1.0 mile north of Los Alamos to 4.0 miles south of Santa Maria; grade and surface for 4-lane expressway	11.9	1,855,000
Santa Barbara	57 (SR 166)	1.7 miles east of Clear Creek to 2.3 miles west of second crossing of Cuyama River; grade and surface (straighten and widen)	0.4	80,000
Santa Barbara	Various	Rights of way on state highway routes		1,470,000
Santa Clara	2 (US 101)	Llagas Creek to Ford Rd.; grade and surface (widen to 4 lanes)	12.3	1,000,000
Santa Clara, San Mateo	2 (US 101)	El Camino Real, 0.1 mile north of University Ave. to 0.1 mile north of the Santa Clara-San Mateo county line; grade and surface (widen)	0.5	240,000
Santa Clara	42 (SR 9)	Saratoga Creek; redeck 2 bridges		15,000
Santa Clara	68 (US 101 Bypass)	Bayshore Freeway-Santa Clara St. in San Jose to Rosa St.; grade, pave and structures for 4-lane freeway	1.6	1,600,000
Santa Clara	114 (SR 9)	Mathilda Ave.-El Camino Real to Beemer Ave.; grade and surface (widen)	0.8	100,000
Santa Clara	119 (SR 25)	San Benito county line to US 101; grade and surface (realignment)	2.3	420,000
Santa Clara	Various	Rights of way on state highway routes		1,355,000

SR—State Sign Route

County	Route	Description	Approximate mileage	Estimated cost
Santa Cruz	56 (SR 1)	Los Gatos Highway (Rt. 5) to Mission St.; grade, pave and structures for 4-lane expressway	1.3	$1,270,000
Santa Cruz	Various	Rights of way on state highway routes		325,000
Shasta	3 (US 99)	Crespo's to Vollmer's; grade, surface and structures for 4-lane expressway (Dog Creek Bridge under construction)	2.5	1,200,000
Shasta	20 (SR 44)	South Cow Creek; bridge and approaches		168,000
Shasta	28 (US 299)	Stillwater Creek; bridge		80,000
Shasta	28 (US 299)	Montgomery Creek to 0.2 mile east of Hillcrest; grade and surface (realignment)	3.5	685,000
Shasta	83 (SR 89)	Doyel Cattlepass; reconstruct		30,000
Shasta	Various	Rights of way on state highway routes		305,000
Sierra	Various	Rights of way on state highway routes		3,000
Siskiyou	3 (US 99)	Fisher's to Pine St. in Dunsmuir; grade and surface (some widening and realignment)	1.5	60,000
Siskiyou	Various	Rights of way on state highway routes		335,000
Solano	7 (US 40)	Carquinez Bridge to Greenfield Ave. (portions); interchange structure at Manzanita St.		310,000
Solano	7 (US 40)	Greenfield Ave. to Sign Rt. 48; grade and surface frontage roads	1.8	120,000
Solano	53 (SR 12)	Suisun to 5 miles easterly; grade and surface (widening)	5.0	250,000
Solano	Various	Rights of way on state highway routes		1,285,000
Sonoma	56 (SR 1)	Jenner to Mendocino county line (portions); grade and surface (widen)	10±	200,000
Sonoma	104	Gravenstein Highway-Sebastopol to US 101 (portions); reconstruct	2.7	140,000
Sonoma	Various	Rights of way on state highway routes		415,000
Stanislaus	13	In Riverbank; grade and surface (widen) (State's share)	0.7	50,000
Stanislaus	Various	Rights of way on state highway routes		160,000
Sutter	15 (SR 20)	Meridian to Sutter Bypass (portions); surface	3.0	60,000
Tehama	3 (US 99E)	Butte county line to Los Molinos; grade and surface (widen to match previously widened bridges)	12.0	850,000
Tehama	Various	Rights of way on state highway routes		12,000
Trinity	20 (US 299)	Vitzhum's to Tom Lang Gulch; grade and surface (realignment)	3.5	700,000
Trinity	20 (US 299)	Humboldt county line to Prairie Creek (portions); surface	11±	75,000
Trinity	Various	Rights of way on state highway routes		10,000
Tulare	4 (US 99)	0.5 mile north of Earlimart to 0.5 mile north of Pixley; grade, pave and structures for 4-lane freeway	6.0	2,000,000
Tulare	129 (SR 65)	1.5 miles north of Deer Creek to Linda Vista Ave.; grade and pave to complete Porterville relocation	7.5	900,000
Tulare	Various	Rights of way on state highway routes		500,000
Tuolumne	40 (SR 49-120)	Shawmut Grade; grade and surface (realignment)	2.0	375,000
Tuolumne	65 (SR 49)	Columbia Wye to Calaveras county line; grade and surface (portions) (widening)	7.5	100,000
Tuolumne	Various	Rights of way on state highway routes		25,000
Ventura	79 (SR 126)	Near Mound School to 2.4 miles easterly; reconstruct	2.4	75,000
Ventura	138 (US 399)	US 101 to 0.3 mile south of Mill School; grade, pave and structures for 4-lane freeway	3.9	2,000,000
Ventura	Various	Rights of way on state highway routes		1,435,000
Yolo	7 (US 99W)	0.5 mile south of Cache Creek to 0.5 mile north of Yolo; grade, surface and structure (realignment, including new bridge)	1.5	460,000
Yolo	Various	Rights of way on state highway routes		21,000
Yuba	3 (US 99E)	Olivehurst to Marysville; grade (for 4-lane expressway) (structures under contract)	4.0	700,000
Yuba	87 (US 40 Alt.)	Simmerly Slough Bridge and line change; grade, surface and structures (realignment, railroad underpass and bridge)	1.5	725,000

SR = State Sign Route.

NEW BUDGET

Continued from page 41 . . .

way Extension (Route 159), both in the San Fernando Valley; $4,750,000 for the Olympic Freeway; $2,500,000 for the Long Beach (Los Angeles River) Freeway; $2,820,000 for the Harbor Freeway; and $2,200,000 for the Sepulveda Freeway.

The Sepulveda Freeway right-of-way item includes start of work on the unit from Ohio Avenue to Waterford Street through the U. S. Veterans Home in West Los Angeles. Under pending right of way agreement with the Federal Government, the State, in exchange for land to be occupied by the new freeway, will provide a separation structure, and accomplish county road and utilities adjustments.

In other Southern California areas, $1,350,000 for rights of way on the Santa Ana Freeway in Orange County; $1,100,000 for a north-south freeway in the Riverside area; $2,500,000 for a north-south freeway in the San Bernardino area; $1,341,000 for the Sign Route 94 freeway in San Diego; and $900,000 for the freeway in the vicinity of La Mesa, east of San Diego.

HILLS AND MOUNTAINS OF CALIFORNIA

Three-fourths of the area of California comprises rolling hills, foothills, and mountains ranging in elevation from 500 feet to 14,000 feet.

MAGAZINE DISPLAYED

THE CITY OF TULSA, OKLAHOMA

November 8, 1954

California State Highway Commission
Sacramento, California

Dear Sir: I want to thank you for putting us on the mailing list for the *California Highways and Public Works* magazine. It is certainly an outstanding portrayal of your rapidly expanding street and highway programs.

The September-October issue arrived just in time to be displayed at our municipal open house, which we held November 4-6, 1954.

Very truly yours,

Sid W. Patterson, Commissioner
Streets and Public Property

Orinda Crossroads

First Link of Oakland-Walnut Creek Job for Traffic Relief

By D. M. YOUNG, Resident Engineer

Work was started September 21, 1953, by Fredrickson & Watson and M & K Corporation on construction of one and two-tenths miles of six-lane freeway along Mount Diablo Boulevard together with undercrossing and interchange ramps at the Orinda Crossroads.

This project, scheduled for completion early next year, will be the first link of the Oakland-Walnut Creek freeway, ultimately designed to overcome a congested traffic situation brought on by the rapid housing growth in the southeast section of Contra Costa County.

The Crossroads as part of the "Tunnel Strip," has been a well-known junction for numerous years. Formerly known as Bryant, the Crossroads is now the center of a community boasting 10,000 population. Protected from fog by the Eastbay hills, sprawling among semiwooded slopes, Orinda provides country living for metropolitan workers.

Orinda Crossroads, then known as Bryant, as it appeared in 1910

First Broadway Tunnel

Contra Costa County's first road ordinance, enacted in 1852, required all males 18 to 45 years of age to contribute five days road work per year. Road work then consisted of building and maintaining wooden bridges and filling ruts left indented by wagons and carriages. The first Broadway Tunnel, constructed of wooden beams and timber lining in 1897, remained in service until completion of the new low level tunnel in 1937. On April 1, 1931, Mount Diablo Boulevard, consisting of an 18-foot concrete pavement, became Route 75 (Sign Route 24) of the State Highway System by act of State Legislature.

In 1936, realignment, new gradients and widening to three lanes of asphalt pavement was done. Subsequently during the 1940's, Highway 24 was widened to four lanes from Oakland to Walnut Creek and channelization with signals was introduced at the Orinda Crossroads.

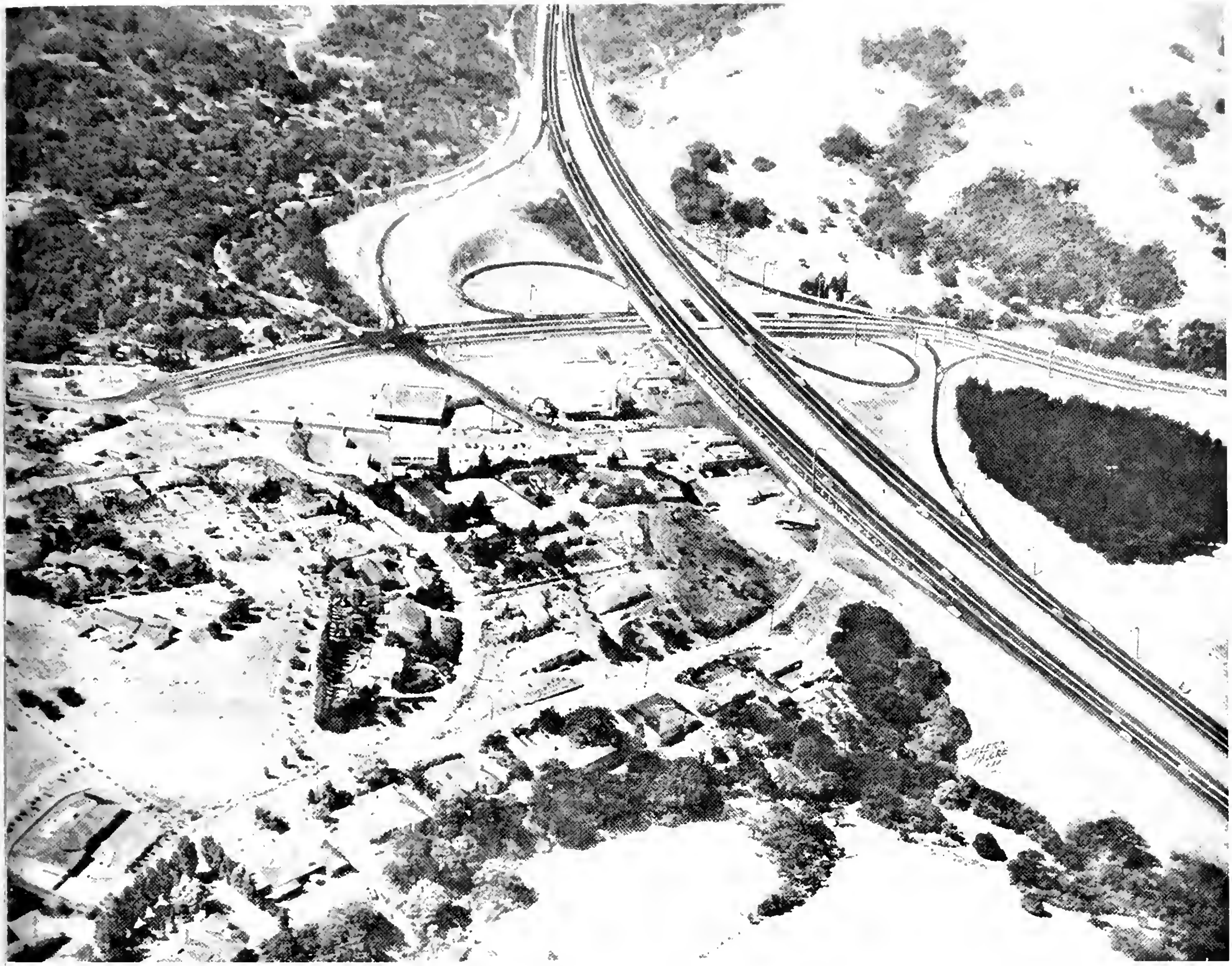
Traffic Volume Increases

Traffic volume through the Crossroads increased from approximately 3,500 vehicles per day in 1931 to over 14,000 in 1941. During the war years, the vehicular count declined to less than 11,000 per day, effected by both gasoline rationing and curtailment of automobile manufacture. Lifting of these bans caused a rapid and steady increase in traffic which reached approximately 23,000 vehicles per day in 1947. There was little gain in traffic volume then until 1949 when the large building boom of the area projected a rising increase so that the volume is now approaching 37,000 vehicles per day.

The existing four-lane highway with the signalized intersection presents a serious bottleneck to commuters. During the evening peak hour period, traffic from the bay area approaches the intersection at the approximate rate of 1,500 vehicles per hour per lane. Since this volume greatly exceeds the capacity of the signalized intersection there results a long back-up of vehicles and an undesirable delay to the commuters, particularly in the evening peak period.

Delay of morning traffic is somewhat less, due to a lighter but longer peak period. Traffic accidents or slow moving trucks during the peak periods cause further traffic backlogs and added loss of vehicular time reaching momentous proportions.

Traffic slowdown is also accentuated by the commuters taking keen interest in work progress during their daily drive through the project.



How the Orinda Cloverleaf will look when completed early in 1955. Carleton Moore, staff artist for the "Oakland Tribune," has, from careful study of construction plans, superimposed the interchange on an aerial photograph.

Traffic Handling Problem

As the alignment of the new freeway corresponds in general with that of the existing highway, routing of the large volume of traffic during construction creates quite a problem. Planning of the project included six stages of traffic patterns. Spot construction is prevalent on both sides of the existing highway with temporary connections being made so that traffic may use the completed portions as detours. Placing of temporary signals is being done to accommodate cross traffic during construction of the final half of the underpass structure.

The big Orinda slide of December, 1950, which closed State Highway 24 for several days was brought to mind when a deep culvert excavation removed support from an adjacent hillside and precipitated its movement towards the highway. Quick action by the contractor's crew in bulldozing earth back into the trench succeeded in containing the movement to negligible proportions and prevented disastrous consequences to the several residences.

Orinda Road Undercrossing

A reinforced concrete box girder bridge composed of two adjacent structures, each of one span 91 feet in length, supported by reinforced concrete abutments on steel piles, will provide six lanes divided for east-west freeway traffic over four-lane north-south traffic. Right-turn movements follow basically the diamond pattern and encompass two cloverleaf quadrants for left turning traffic onto the freeway. Left turning off the freeway will be accomplished by use of the right turn off-ramps then making a left turn to merge with the undercrossing traffic.

The freeway geometrical section consists of six 12-foot lanes separated by a 40-foot division and having 8-foot outside shoulders. Provision is also made for a future 8-lane highway with 16-foot division of both freeway and bridge.

The freeway structural section consists of eight inches of portland cement concrete on 12 inches of imported subbase of which the top four inches is cement treated. Shoulders consist of three inches of plant-mixed surfacing on six inches of crusher run base all on 10 inches of imported subbase material.

The crossroad and ramps consist of three inches of plant-mixed surfacing on six inches of cement treated base all on eight inches of imported subbase material.

The work is under the general supervision of Assistant State Highway Engineer B. W. Booker, with the author as resident engineer and W. C. Names as the Bridge Department representative of the project.

FORMOSA WANTS MAGAZINE

CHICAGO, ILLINOIS

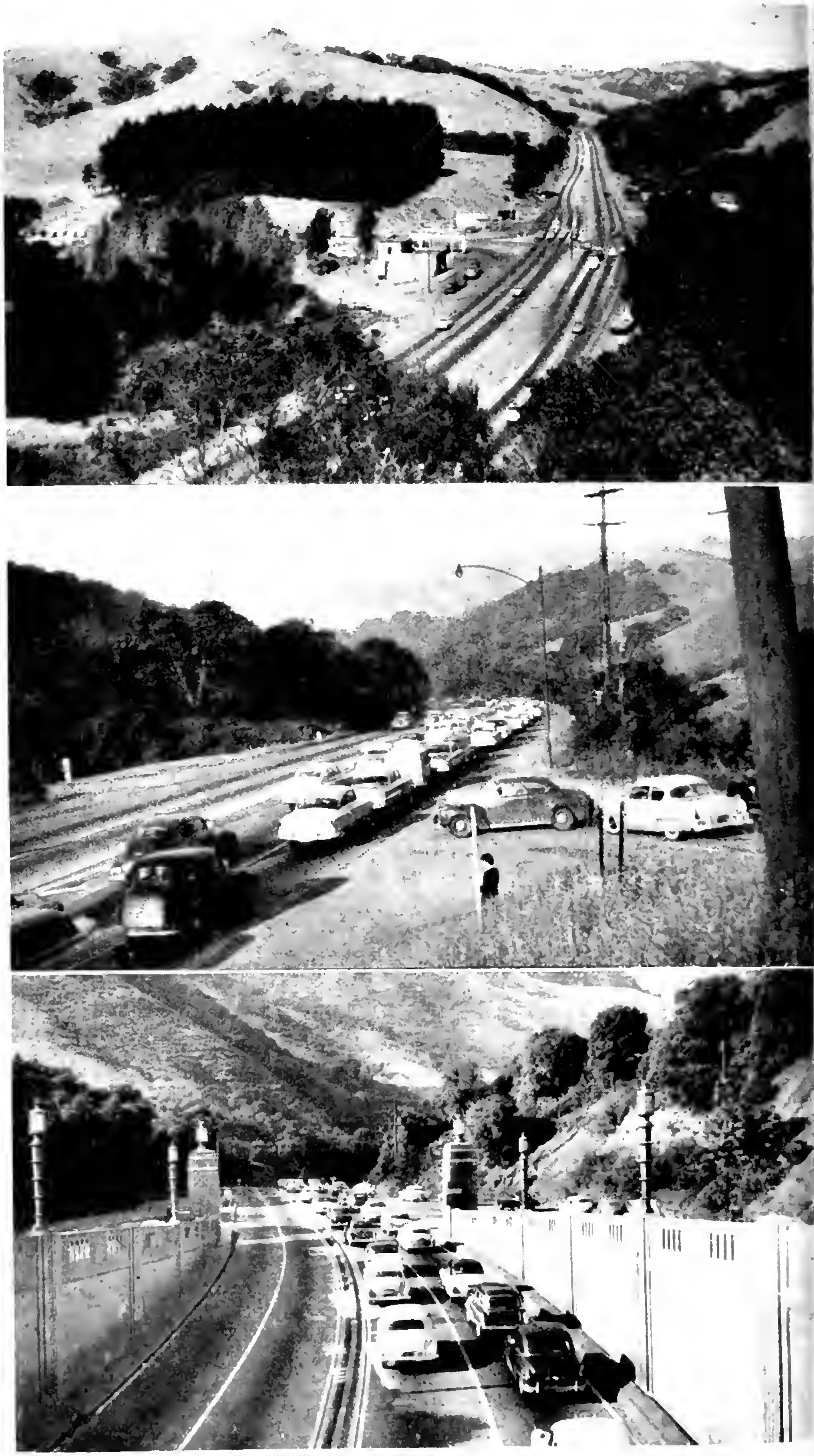
MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: Please accept my sincerest thanks for your very kind letter about a month ago. It is really very kind and nice of you to promise to send a free copy of your highway magazine to my friend in Formosa, Mr. Chen-Teng Lui of the Taiwan Highway Bureau.

Having worked for the Illinois State Highway Division, I have read your magazines very frequently at my office. Our bureau chief, Mr. George F. Hagenauer, has also a copy from you. I sincerely believe that your publication is the best among all the highway magazines throughout this Country. Therefore, I am very happy to know that my friend, Mr. Lui, can have such an excellent opportunity to have a copy for his office. I believe that he and his fellow-workers will be greatly improved through the instructions and actual experiences that you have carefully analyzed and collected for your magazine. This is, of course, one of the best ways you have helped us directly in the highway construction in my native country, China.

Very sincerely yours,

THADDEUS YANG



UPPER: The Orinda Crossroads in September, 1953, prior to construction. CENTER: Morning traffic back-u one mile east of the Orinda Crossroad signal, May, 1954. LOWER: Afternoon traffic back-up two miles we of the Orinda Crossroad signal, May, 1954, showing east portal of Broadway Tunnel.

COME ON OVER

BOURNEMOUTH, ENGLAND

DEAR MR. ADAMS: I am delighted ith *California Highways and Public Vorks.*

In September, 1953, I went to the nited States for a month in connecon with the fall meeting of the coustical Society of America at leveland, Ohio, followed by a lecire tour including St. Louis and Boson and places in between traveling y road but not, alas, to California.

My companion, however, was John Vebster of the Navy Electronics Lab. San Diego. When I expressed delight such marvels as the Pennsylvania urnpike, the Lincoln and Holland unnels and the George Washington ridge, he insisted that California had igger and better marvels, and he has nce sent me several copies of your urnal.

I read every page with the greatest f pleasure, especially as I can feel that is produced by real enthusiasts, who idently share my delight in the gloous achievements of highway engieering that are so typically American. have formed a determination to go nd see it all myself and see how the ayshore Freeway is getting on and to ave a look at the Richmond-San Rael Bridge.

Yours sincerely,

WALTER LAWRENCE
Signal Research and Development Establishment, England

WE THANK YOU

THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

IR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: We always eny reading your fine magazine, *California Highways and Public Works,* nd we find the engineering material your September-October issue very npressive.

I wish to express or appreciation to ou and your staff.

Sincerely yours,

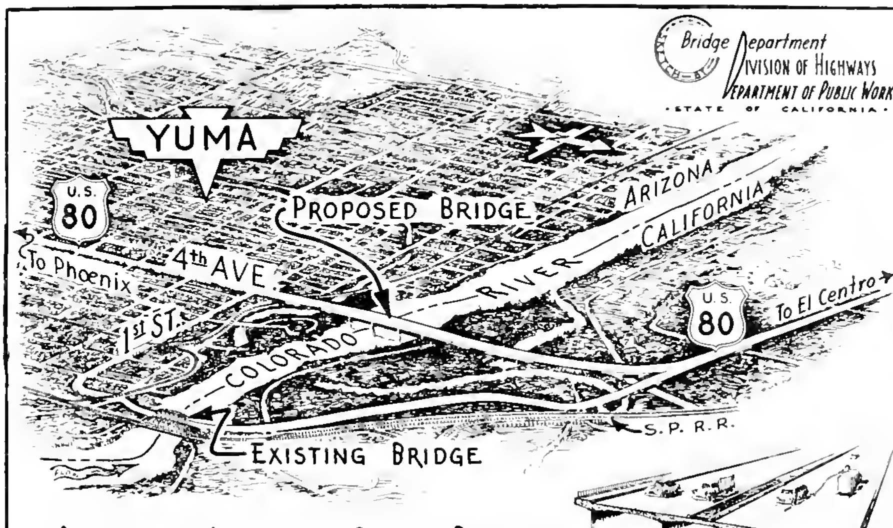
KENNETH B. BARNES, *Editor*

BIGGEST KILLER

Motor vehicle accidents are still the ggest single killer of children from to 14 years of age.

JOINT VENTURE—NEW COLORADO RIVER SPAN

The Division of Highways will open bids in Los Angeles on December 2d for construction of a bridge across the Colorado River on US Highway 80 which will connect Winterhaven, Imperial County, and Yuma, Arizona, and for which California and Arizona have budgeted a total of $1,600,000.



PROPOSED COLORADO RIVER BRIDGE

TYPICAL SECTION

The two states will share equally in the cost of the bridge, which will be built under the supervision of the California Division of Highways. In other contracts, Arizona will construct the approach to the bridge on its side of the river and California will build almost a mile of new highway from Winterhaven to the bridge.

On the Arizona side, the bridge will connect with an extension of Fourth Street in Yuma.

The new bridge, to be located about half a mile downstream from the present crossing, will be about 837 feet long, of riveted steel plate girder construction. There will be five spans, and a reinforced concrete deck supported by reinforced concrete abutments and piers, with steel pile foundations.

Two 28-foot roadways, separated by a median strip almost six feet wide, will be provided for four-lane traffic. There also will be a five-foot sidewalk. The California Highway Commission has budgeted $800,000 to cover this State's share of the construction cost.

Although a new bridge is required to meet traffic conditions, it is proposed to keep the existing bridge in service as "Business Route 80." It also will serve the Indian School on the California side of the river.

The present bridge is one way for trucks and busses and is posted for a speed limit of five miles an hour for vehicles of more than 10 tons in weight. Average daily traffic volume is 6,000 vehicles, about one-fifth of them commercial.

The California Division of Highways expects to advertise soon for bids on the constrction of a four-lane divided highway to take US 80 on the new line from Winterhaven to the new bridge. Funds in the amount of $455,000 have been budgeted for the work. The route for this section of highway was adopted last May. It curves southwesterly of the present highway and is almost a third of a mile shorter.

TRY COURTESY WITH PEDESTRIANS

Try a little courtesy with pedestrians. You don't have to force them back on the sidewalk when they have a right to cross or oblige them to jump to avoid your bumper.

Traffic Count *Shows for 1954 an Increase Of 5.75 Percent Over That of 1953*

By G. T. McCOY, State Highway Engineer

The annual state-wide traffic count taken on Sunday and Monday, July 18 and 19, 1954, shows an increase of 5.75 percent over the previous annual count of July, 1953. This gain is not general as evidenced by the fact that interstate travel showed a decrease. The count increase is due primarily to the high volumes of traffic induced by the expanding mileage of freeways, particularly in the Los Angeles and San Francisco areas of the State.

Freight Vehicles Show Greatest Increase

Monthly traffic counts again show freight vehicles increasing at a substantially faster rate than passenger vehicles. Also, for the third straight year, Sunday traffic increases are markedly less than those for weekday traffic. These factors point to the diminishing influence of pleasure travel in the over-all traffic picture.

Covered 16-hour Period

No change was made from the regular procedure of previous years in the manner of taking the count. Actual recording covers the 16-hour period from 6 a.m. to 10 p.m. for both Sunday and Monday, totals being shown for each hour. At selected representative stations, counts are also continued for the entire 24-hour period and are extended to record each of the seven days of the week. Traffic is segregated into the following vehicle classifications: California passenger cars, out-of-state passenger cars, busses, pickups, two-axle commercial units, three-axle uni four-axle units, five-axle uni and six-or-more-axle units.

Minor Changes Necessary

Each year some minor chang in the census become necessar such as the relocation, additio or discontinuance of individu stations; but in every instan these are excluded in determi ing comparison with the prev ous year, only those stations th were identical during the yea 1953 and 1954 being taken in consideration.

These comparisons for t various route groups are as fo lows:

PERCENT GAIN OR LOSS FOR 195 COUNT AS COMPARED WITH 195

	Sunday	*Mon*
All routes	+3.35	+6.5
Main north and south routes	+5.57	+7
Interstate connections	—2.98	—1.5
Laterals bet. inland and coast	+1.13	+5.5
Recreational routes	+2.28	+7.2

The gain or loss of traffic v ume for State Highway Rou s 1 to 80, inclusive, which con tute the basis for the forego g summary, is shown in the l low tabulation:

SITTIN' AND COUNTIN'

Equipped with clickers, chart and code,
Here I sit by the side of the road—
I mean by the side of the highway,
For once each year, in mid-July
We count the cars as they roll by,
So the State will know where the taxes go
On the heavier traveled highways.

Busses and trucks and passenger cars,
Two-axle, three-axle— oh, my stars—
What are those three-cornered concrete things
Like coffins on edge, in pairs or strings
Of three or more, just what are they?
Some off-breed truck, in cement gray,
Cruising along on the highway?

Big semi's and panels and pickups
A jalopy that seems to have hiccups,
And coming up slowly beside her,
Like a giant tall-legged spider,
A yellow johemi is creeping along,
And where on the chart does it belong?
And where on the crowded highway?

A cement truck goes whirling by,
Mixing its contents on the fly,
A flat-bed truck with tail-end flags,
And a "foreign" car that gaily drags
A trailer packed with beds and bags
That like a jointed beetle wags
Itself along the highway.

Tractors and trailers and foreign jobs,
Tankers and oil-trucks roar by in mobs;
Four-axle, five-axle— big dual tires—
Sigh on the road like singing wires—
As I count with clickers, chart and code
Sitting alone by the side of the road—
Or I mean by the side of the highway.

—MARION S. SCHERMERHORN
San Bernardino

Route	Termini	1954—Percent gain or loss			
		Sunday		Monday	
		Gain	Loss	Gain	Lo
1.	Sausalito-Oregon line	2.81		9.44	
2.	Mexico line-San Francisco	15.60		14.32	
3.	Sacramento-Oregon line	0.59		2.19	
4.	Los Angeles-Sacramento	3.76		4.68	
5.	Santa Cruz-Junction Rt. 65 near Mokelumne Hill		3.19		3 5
6.	Napa-Sacramento via Winters		3.41	6.23	

Route	Termini	1954—Percent gain or loss			
		Sunday		Monday	
		Gain	Loss	Gain	Loss
7.	Crockett-Red Bluff	4.00		2.11	
8.	Ignacio-Cordelia via Napa		2.22	5.11	
9.	Rt. 2 near Montalvo-San Bernardino		4.14	2.59	
10.	Rt. 2 at San Lucas-Sequoia National Park		1.44	2.97	
11.	Rt. 75 near Antioch-Nevada line via Placerville	1.01		1.17	
12.	San Diego-El Centro	7.27		2.94	
13.	Rt. 4 at Salida-Rt. 23 at Sonora Junction	0.21		6.91	
14.	Albany-Martinez		1.67		1.41
15.	Rt. 1 near Calpella-Rt. 37 near Cisco	6.77		11.94	
16.	Hopland-Lakeport	4.45			1.84
17.	Rt. 3 at Roseville-Rt. 15, Nevada City		3.18		4.84
18.	Rt. 4 at Merced-Yosemite National Park		8.80	8.36	
19.	Rt. 2 at Fullerton-Rt. 26 at Beaumont		2.93	0.34	
20.	Rt. 1 near Arcata-Rt. 83 at Park boundary	2.74		4.34	
21.	Rt. 3 near Richvale-Rt. 29 near Chilcoot via Quincy		7.41	4.36	
22.	Rt. 56, Castroville-Rt. 32 via Hollister	1.81		6.43	
23.	Rt. 4 at Tunnel Sta.-Rt. 11, Alpine Junction	3.52		9.88	
24.	Rt. 4 near Lodi-Nevada state line		5.15	0.99	
25.	Rt. 37 at Colfax-Rt. 83 near Sattley		3.42	2.69	
26.	Los Angeles-Mexico via San Bernardino	7.73		14.27	
27.	El Centro-Yuma		8.44		11.86
28.	Redding-Nevada line via Alturas		9.20	15.26	
29.	Peanut-Nevada line near Purdy's		9.10	4.63	
31.	Colton-Nevada state line		1.93	1.07	
32.	Rt. 56, Watsonville-Rt. 4 near Califa		1.98	0.34	
33.	Rt. 56 near Cambria-Rt. 4 near Famoso		8.14		1.16
34.	Rt. 4 at Galt-Rt. 23 at Pickett's Junction	0.34		4.44	
35.	Rt. 1 at Alton-Rt. 20 at Douglas City	5.44		2.04	
37.	Auburn-Truckee		7.38		4.77
38.	Rt. 11 at Mays-Nevada line via Truckee River	7.31		19.34	
39.	Rt. 38 at Tahoe City-Nevada state line	30.53		29.50	
40.	Rt. 13 near Montezuma-Rt. 76 at Benton	28.30		26.19	
41.	Rt. 5 near Tracy-Kings River Canyon via Fresno	7.71		10.01	
42.	Redwood Park-Los Gatos		12.40		0.89
43.	Rt. 60 at Newport Beach-Rt. 31 near Victorville	1.68		7.06	
44.	Boulder Creek-Redwood Park		2.49	13.98	
45.	Rt. 7, Willows-Rt. 3 near Biggs	0.11			6.73
46.	Rt. 1 near Klamath-Rt. 3 near Cray		13.75		3.56
47.	Rt. 7, Orland-Rt. 29 near Morgan		5.73		2.74
48.	Rt. 1 N. of Cloverdale-Rt. 56 near Albion		5.08	9.61	
49.	Napa-Rt. 15 near Sweet Hollow Summit	3.66		7.42	
50.	Sacramento-Rt. 15 near Wilbur Springs		1.27	2.15	
51.	Rt. 8 at Shellville-Sebastopol	9.08		19.93	
52.	Alto-Tiburon	0.44		16.36	
53.	Rt. 7 at Fairfield-Rt. 4 near Lodi via Rio Vista	4.15			0.07
54.	Rt. 11 at Perkins-Rt. 65 at Central House	1.06		3.86	
55.	Rt. 5 near Glenwood-San Francisco	8.77		2.19	
56.	Rt. 2 at Las Cruces-Rt. 1 near Fernbridge	0.57		6.45	
57.	Rt. 2 near Santa Maria-Rt. 23 near Freeman via Bakersfield		2.83		0.26
58.	Rt. 2 near Santa Margarita-Arizona line near Topock via Mojave and Barstow		3.87		5.06
59.	Rt. 4 at Gorman-Rt. 43 at Lake Arrowhead	8.76		12.56	
60.	Rt. 2 at Serra-Rt. 2 at El Rio		5.26		3.32
61.	Rt. 4 S. of Glendale-Rt. 59 near Phelan	16.59		5.56	
62.	Rt. 171 near Buena Park-Rt. 61 near Crystal Lake	23.40		15.28	
63.	Big Pine-Nevada state line		35.14		21.91
64.	Rt. 2 at San Juan Capistrano-Blythe		7.88		7.37
65.	Rt. 18 near Mariposa-Auburn	4.13		8.96	
66.	Rt. 5 near Mossdale-Rt. 13 near Oakdale		5.38	1.99	
67.	Pajaro River-Rt. 2 near San Benito River Bridge	7.84		9.94	
68.	San Jose-San Francisco	10.16		13.94	
69.	Rt. 5 at Warm Springs-Rt. 1, San Rafael	6.50		6.46	
70.	Ukiah-Talmage		6.46	9.26	
71.	Crescent City-Oregon line	12.71			5.02
72.	Weed-Oregon line	1.26		3.61	
73.	Rt. 29 near Johnstonville-Oregon line	5.60		11.38	
74.	Napa Wye-Cordelia via Vallejo and Benicia		1.90		4.00
75.	Oakland-Junction Rt. 65 at Altaville		3.00	2.71	
76.	Rt. 125 at Shaw Ave.-Nevada state line near Benton	8.93		8.02	
77.	San Diego-Los Angeles via Pomona	2.07			1.59
78.	Rt. 12 near Descanso-Rt. 19 near March Field	1.43			6.34
79.	Rt. 2, Ventura-Rt. 4 at Castaic	0.77		1.77	
80.	Rt. 51, Rincon Creek-Rt. 2 near Zaca	10.74		9.08	

Herbert R. Robinson

Herbert R. "Bert" Robinson of the Division of Highways will retire at the end of the year, bringing to an end 34 years of service with the State, all of it with the District IV office.

Bert came to work for the division as a member of a survey party in Marin County on April 15, 1920. For the past several years he has been assigned to construction projects in the Santa Cruz area, where he has done location and survey work.

Bert was born in Bryson City, North Carolina, and attended grade and high school at Conconully, Washington. From 1911 to 1917 he worked for various private companies including two years as rodman and chainman on the Kittle Valley Railroad survey in British Columbia.

During World War I he served with the U. S. Army Artillery, coming to California in 1920 after he received his discharge.

After retirement, Bert intends to live at his home at 222 San Lorenzo Avenue in Felton.

THIS LETTER IS APPRECIATED

Mr. Kenneth C. Adams, *Editor*

Dear Mr. Adams: This is to express the appreciation of the people in this community interested in highways for the fine article on the "Development of Historic US 50" in the September-October issue of *California Highways and Public Works*. Also I wish to add my appreciation for the article on page 22 on the opening of the Monitor Pass route on Highway 89 in Alpine and Mono Counties. This highway will ultimately be of great importance to Amador County and the Lake Tahoe region of El Dorado County.

Please accept my congratulations on the colored cover picture of Strawberry and Lovers Leap on US Highway 50. It is a fine piece of work.

Very sincerely yours,

Swift Berry
State Senator

NEW RIGHT-OF-WAY GROUP FORMED

The third group of right-of-way men in California to become affiliated with the American Right-of-Way Association was officially recognized in San Diego when the San Diego Club Affiliate of Los Angeles Chapter No. 1 was granted its charter at an inaugural dinner meeting attended by members of the Los Angeles chapter and many prominent San Diegans before an audience of 140 men.

Left to right: Chapter President Dexter D. MacBride, Club Chairman John C. Webb, National Chairman Frank C. Balfour

In presenting the charter to its newly elected chairman, John C. Webb, Supervising Right-of-Way Agent of the Division of Highways in District XI, President Dexter MacBride, Senior Right-of-Way Agent for the Division of Highways in District VII, outlined the purposes of the club affiliate.

"There are many members," said MacBride, "who reside too far from the chapter headquarters to attend meetings regularly, and enjoy the benefits of the association's educational program. The club affiliate, with relatively few members, is able to operate locally through the aid of the chapter in furnishing speakers and educational seminars."

Balfour Gives Address

In accepting the charter on behalf of the club, Webb added that he "hoped that our experience and the pattern that has been established will be helpful toward the formation of other club affiliates where needed."

National Chairman Frank C. Balfour, Chief Right-of-Way Agent for the Division of Highways, gave an address on "The Aims and Policies of the American Right-of-Way Association."

"If we desire to maintain professional status, obviously we must operate as professional men," said Balfour. He urged the members to abandon the time worn practice of "horsetrading" in negotiations for the purchase of right of way and to base offers on sound prenegotiation appraisals made by capable and thoroughly trained men.

"The very foundation on which the American Right-of-Way Association was created and exists is *education*," continued Balfour. "Better education of our land acquisition members to the end that they are better equipped to serve their employers, and at the same time to more efficiently and honestly protect the property owners who are affected by our operations.

"As of this date, there is not a single university or college in the United States that gives a full four-year course to properly educate and train young men to accept positions in the right-of-way profession.

Educational Program

"The only educational program that is being carried on in this Nation to train and assist right-of-way men so that they can better serve the taxpayers or the stockholders of the organizations they represent is by the American Right-of-Way Association and this condition exists notwithstanding the fact that public and quasi-public right of way and land acquisition men are confronted during the calendar year 1954 with a program of acquiring lands and rights in lands that will exceed 7 billion dollars in expenditures.

"A tremendous amount of the taxpayers' and stockholders' money is being spent and will continue to be spent for land acquisition in our State, and we in the American Right-of-Way Association cannot and will not in fairness to our principals who are planning these vast improvements, or to the affected property owners, entrust the expenditure of this huge sum of money to inexperienced or untrained personnel.

"We must realize that inefficiency or incompetency to the extent of only 10 percent would, in the California State Highway Right-of-Way Department alone, represent a loss of 10 million dollars to our taxpayers during the current year."

Elected Officers

Other elected officers of the club are V. L. Larson, Right of Way Supervisor of The Pacific Telephone & Telegraph Company, Vice Chairman

. . . Continued on page 5

Cost Index

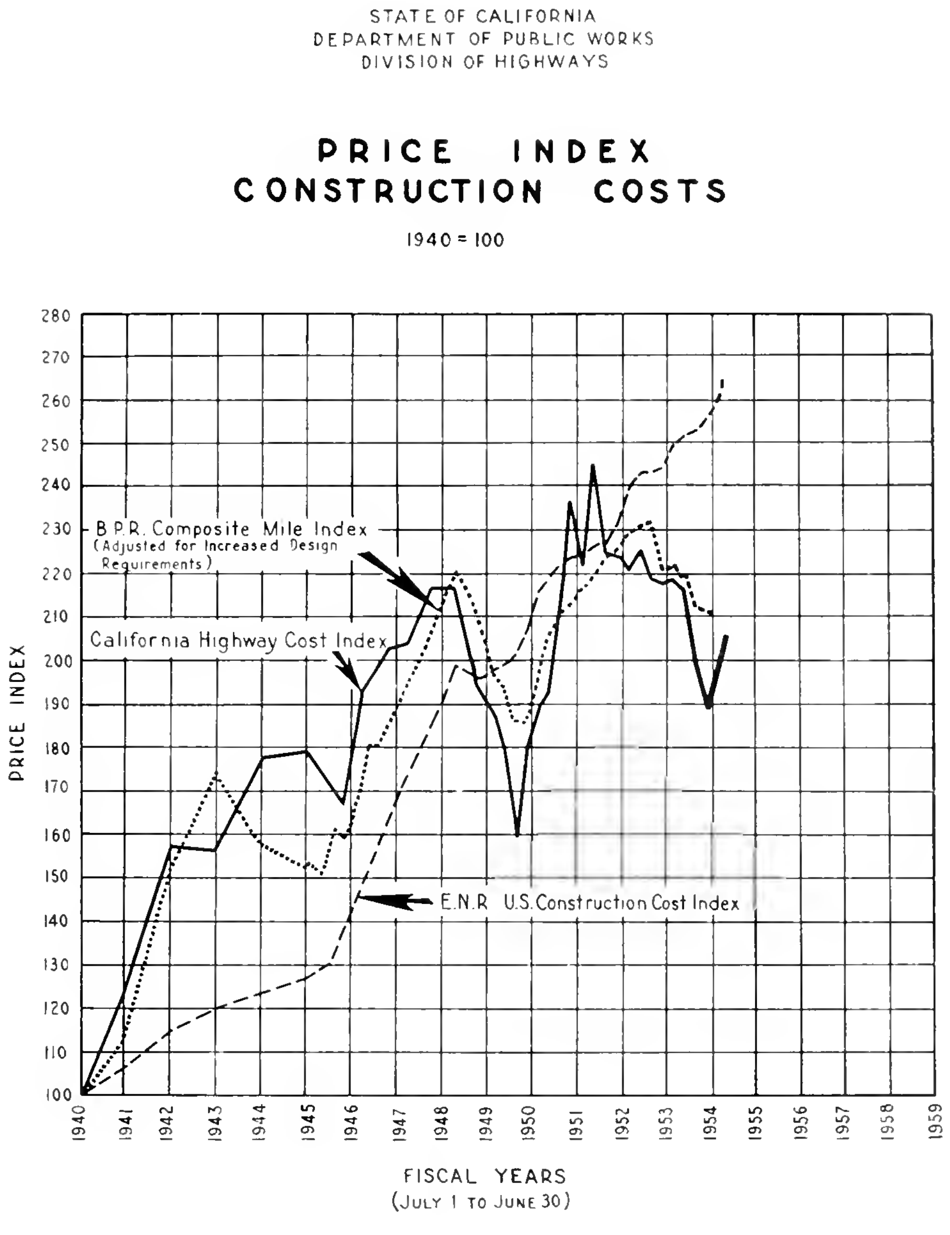
Downward Trend Breaks as Highway Construction Costs on Rise

By RICHARD H. WILSON, Assistant State Highway Engineer; H. C. McCARTY, Office Engineer; JOHN D. GALLAGHER, Assistant Office Engineer

THE ANTICIPATED break of the general lownward trend in highway construcion costs in California, which has been n progress since the fourth quarter of 951, was apparently reached during he third quarter of 1954.

The upswing is indicated by a rise of 9.9 percent in the California Highvay Construction Cost Index over the econd quarter. Computation of the ndex showed it to be at 207.8 (1940 = 100) for the months of July, August and September, a rise of 18.8 index points over the 189.0 for April, May and June. The third quarter index is 4.2 percent over that of the first quarer of the year, but is 4.8 percent below he fourth quarter of 1953. It still is 15.3 percent under the 245.4 for the fourth quarter of 1951, which was the highest point in Division of Highways history. However, it is 29.9 percent above the first quarter of 1950, which was the low point prior to the Korean outbreak.

The accompanying tabulation shows the California Highway Construction Cost Index by years from 1940 to 1949 and by quarters from 1950 to 1954.



THE CALIFORNIA HIGHWAY CONSTRUCTION COST INDEX

Year	Cost Index
1940	100.0
1941	125.0
1942	157.5
1943	156.4
1944	177.8
1945	179.5
1946	179.7
1947	203.3
1948	216.6
1949	190.7
1950 (1st quarter)	160.6
1950 (2d quarter)	180.0
1950 (3d quarter)	189.2
1950 (4th quarter)	194.8
1951 (1st quarter)	215.4
1951 (2d quarter)	238.3
1951 (3d quarter)	221.9
1951 (4th quarter)	245.4
1952 (1st quarter)	224.8
1952 (2d quarter)	224.4
1952 (3d quarter)	221.2
1952 (4th quarter)	226.2
1953 (1st quarter)	218.3
1953 (2d quarter)	217.5
1953 (3d quarter)	218.0
1953 (4th quarter)	216.7
1954 (1st quarter)	199.4
1954 (2d quarter)	189.0
1954 (3d quarter)	207.8

As previously reported, the decline in highway construction prices which has been general since the end of 1951 largely has been the result of keen competition among bidders and has occurred in spite of continuing increases in labor costs resulting from wage boosts and extended fringe benefits. It seems apparent that with the upturn of bid prices on California highway construction, as indicated by the 9.9 percent rise in the index during the third quarter of 1954, the balance of factors which affect bid prices has swung from control by competition to control by increased payments to labor.

It is believed, however, that excellent competition will continue, which coupled with continuing improvements in production through mechanical means will hold the rise in check. The effect of the proposed large federal highway building program would probably tend toward an upward trend in prices.

The accompanying tabulation of average contract unit prices for the eight items on which the California Highway Construction Cost Index is based shows such unit prices by years and quarters since 1940. From this tabulation it will be noted that during the third quarter of 1954 the average unit prices for six of the eight items showed increases, only the average unit prices of untreated rock base and portland cement concrete pavement declined, the other six all showed increases.

The largest increase was in structural steel which jumped 42.1 percent, nearly 5 cents a pound. While this increase in the price of structural steel is in some degree the result of rising labor costs catching up with bid prices, much of the high jump may be attributed to the fact that during the second quarter seven state highway contracts were awarded for work in the San Francisco and Los Angeles metropolitan areas which involved unusually large quantities of steel. The total quantity of structural steel in contracts awarded during the second quarter of 1954 was approximately 15,000,000 pounds. For the third quarter it was less than 4,000,000 pounds. Undoubtedly these differences in volume accounted for much of the difference in the average unit prices for this item—$0.162 per pound in the third quarter as compared to $0.114 per pound in the second quarter.

However, aside from the item of structural steel, while during the last several quarters contractors have been submitting lower prices in the face of increased labor costs, these increased costs have piled up to the point of counterbalancing the factor of competition.

Roadway excavation rose 13.2 percent during the third quarter, plant-mixed surfacing went up 9.1 percent, structural concrete increased 5.2 percent and bar steel 2.2 percent. While asphalt concrete pavement rose 35.1 percent the quantity placed during the quarter was insufficient to carry much weight in the over-all rise of the index. It is interesting to note that the two items which dropped involve large quantities of rock and both dropped by approximately the same amount 11.5 percent for untreated crushed rock and 11.6 percent for portland cement concrete pavement.

The accompanying chart compares the California Highway Construction Cost Index with the U. S. Bureau of Public Roads Composite Mile Index and the Engineering News-Record Construction Cost Index, all reduced to the base of 1940 = 100. The Bureau of Public Roads Composite Mile Index at 211.0 for the second quarter of 1954 was still following closely on a national basis the California Index. The Engineering News-Record Index, which includes all classes of construction on a nation-wide basis, continued during the third quarter its rise, from 255.8 to 264.9 (up 3.6 percent). The large percentage of building construction included in this latter index is apparently responsible for the differences between it and the two road construction cost indexes.

While highway construction prices in California made a sharp upturn during the third qarter it is thought that the trend will be to level off with a much slower rate of rise during the next few quarters.

CALIFORNIA DIVISION OF HIGHWAYS—AVERAGE CONTRACT PRICES

	Roadway excavation, Per cu. yd.	Crusher run base, Per ton	Plant mix surfacing, Per ton	Asphalt concrete pavement, Per ton	PCC pavement, Per cu. yd.	PCC structures Per cu. yd.	Bar reinforcing steel, Per lb.	Structural steel, Per lb.
1940	$0.22	$1.54	$2.19	$2.97	$7.68	$18.33	$0.040	$0.083
1941	0 26	2.31	2.84	3.18	7.54	23.31	0.053	0.107
1942	0.35	2.81	4.02	4.16	9.62	29.48	0.073	0.103
1943	0.42	2.26	3.71	4.76	11.48	31.76	0.059	0.080
1944	0.50	2.45	4.10	4.50	10.46	31.99	0.054	0.132
1945	0 51	2.42	4.20	4 88	10.90	37.20	0.059	0.102
1946	0.41	2.45	4.00	4.68	9.48	37.38	0.060	0 099
1947	0.46	2.42	4.32	5.38	12.38	48.44	0.080	0.138
1948	0.55	2 43	4.30	5 38	13.04	49.86	0.092	0.126
1949	0.49	2 67	4.67	4 64	12.28	48.67	0.096	0.117
1st quarter 1950	0.34	2 22	3.65	3.74		40.15	0.077	0.081
2d quarter 1950	0 40	2 13	4.48	3 74	10.86	43.03	0.080	0.105
3d quarter 1950	0 41	2 32	4.25	5 50	10 91	44.34	0.093	0.131
4th quarter 1950	0 42	2 81	4 64	4 61	12.55	43.18	0.098	0.120
1st quarter 1951	0 45	3 07	4 06	5 22	11.71	46.38	0.103	0.206
2d quarter 1951	0 63	3 88	4 56	4 63	12.93	51.50	0.105	0.166
3d quarter 1951	0 56	2 88	4 59	3 90	12 41	46.14	0.107	0 165
4th quarter 1951	0 66	2 91	5 66	4 89	12.71	49.38	0.105	0.169
1st quarter 1952	0 56	3 25	4 88	4 77	14.25	47.46	0.094	0.152
2d quarter 1952	0 53	3 19	5 29	4 13	14 20	49.12	0.091	0.143
3d quarter 1952	0 55	2 61	5 49	4 60	12.80	48 21	0 094	0 132
4th quarter 1952	0 66	2 68	4 97		12.53	48.45	0.094	0.128
1st quarter 1953	0 45	*2 48	5 27	4 46	12.47	53.19	0.098	0.150
2d quarter 1953	0 50	2 07	5 38	4 59	13 06	52.68	0.091	0 132
3d quarter 1953	0 54	2 15	5 30	4 82	13.78	49.23	0.092	0.129
4th quarter 1953	0 48	2 11	4 74	4 47	14.77	53.41	0.105	0.139
1st quarter 1954	0 45	2 28	4 23	4.78	14.89	47.52	0.092	0.126
2d quarter 1954	0 38	2 09	4 29	5 18	14 28	47 12	0 093	0.114
3d quarter 1954	0 43	1 85	4 68	7 00	12.63	49.59	0.095	0.162

* Untreated rock base substituted for crusher run base at this point.

EMPLOYMENT

Total employment in American automotive manufacturing plants reached 920,000 during 1953, according to the National Automobile Club.

SAN MATEO AND DUMBARTON BRIDGE APPROACH PROBLEM

By R. H. "BARNEY" BARNWELL

Upon my reassignment to the Right of Way Engineering Section in June, 1952, Ed Hovde approached me with his arms full of maps, documents, instruments, preliminary reports and photostats. He laid them on the table, and said with a sardonic grin, "They're stinkers; make record maps." It did not take long for me to find that he was not fooling.

R. H. BARNWELL

For the San Mateo Bridge, some 50 deeds, agreements, documents, indentures, photostatic prints, microfilm enlargements of more deeds and so on had to be matched, rearranged and studied. Most of them indicated some encumbrance upon the title to our right of way. One deed, with the early date of September 19, 1867, had something to say about levees, on the Alameda side, part of which is now occupied by the east approach near the Mt. Eden Landing Road. Another conveyed a 50-foot easement to the Southern Pacific Company for railroad purposes from the present Southern Pacific Depot in San Mateo extending northerly to the Bayshore, crossing our right of way near the northeast corner of Shore View Tract No. 10 in San Mateo. The portion across the highway is still held by the company. The portions to the north and south of our right of way have been returned to the appropriate owners, heirs or assigns.

R. H. Barnwell, who retired from his position as Associate Highway Engineer in District IV on July 1, 1954, performed an outstanding job on his last assignment with the Division of Highways. This work involved a determination of the right of way which was obtained by the State through the acquisition of the San Mateo and Dumbarton Bridges, together with their approaches.

While work of this type is highly technical from an engineering and legal standpoint, the unique references to many of the sidelights which Mr. Barnwell encountered make his article highly interesting to the layman as well as to professional readers.

Guano Monument

Nearly all the documents describing land along the west approach refer to a U. S. C. and G. S. triangulation monument on Little Coyote Point at the Toll Plaza, which monument is called "Guano." The San Mateo County Ordinance No. 352, dated July 11, 1927, granting the franchise and authorizing the construction and operation of the bridges goes so far as to fix the position of "Guano" by citing its latitude and longitude to the nearest 0.001 second of arc. The Coast Survey has incorporated it into the California Coordinate System with published Y and X coordinates to 0.01 of a foot. "Guano" is a very valuable point since it marks the control for the right of way from both directions and also marks the center line of the bridge, as built. It has been checked by triangulation of recent years and found to be exactly where it was originally placed.

Tide Lands Survey

The ordinance also mentioned the cost of the seven-mile bridge at the sum of $7,500,000 and an annual maintenance and operating expense of exactly $340,000. Upon these figures the original toll schedules were based. The list of items included everything from motorcycles at 20 cents up through tricars, autos, stagecoaches, trucks, and includes a "wagon of a 10-ton capacity" at $1.

In many of the documents, frequent references are made to Tide Lands Surveys. An intensive study of this subject was required which took me into the archives of the official records of both counties; into the San Francisco City Law Library, and to the Office of the State Land Commission in Sacramento. The personnel of each office was very helpful and generous with photostatic copies of the 30 Tide Lands Surveys Records needed.

Earliest Document

The earliest document found was dated 1856 describing as a 40-acre piece the southeast quarter of the northeast quarter of Section 23, T. 4 S., R. 4 W.; and naming it the S. & O. L. (Swamp and Overflow Land) Survey No. 10. It is recorded in Book 1 of Patents, page 184, San Mateo County Records.

In another deed, one reference proved to be very entertaining. The "call" in the description was, "thence N. 41,908′, E., a distance of 5,772.5 feet more or less to the westerly boundary line of Tide Land Survey No. 87, Alameda County Surveys." By virtue of the distance given, that line, when plotted, showed up just east of the lift span and along the easterly edge of the deep water channel two miles and more into San Mateo County. That sent me hotfooting it to the Alameda County Surveyor's Office. A search placed T. L S. No. 87 about two miles north of our right of way in Alameda County. In the Land Office in Sacramento, it was found that the deed "call" was in error. It should have read, "Tide Land *Location* No. 87 (formerly Tide Land Survey No. 127).

County Line Wanders

About the turn of the century many of the Tideland Surveys were changed in name to Tide Land *Locations* with a different number assigned. We also learned that the "peripatetic" Alameda-San Mateo county line had wandered back and forth across the Bay several times during the last 80 years or so, finally coming to rest at its present position.

To get the picture of these various T. L. L., T. L. S., and S. and O. L. Surveys, a navigator's chart of San Francisco Bay—Southern Part—published by the U. S. C. and G. S. was secured. Upon this chart is shown in feet the depth to Bay bottom below mean lower low water; the deep water channel extending southeasterly into the mouth of the Guadalupe River, east of Palo Alto; and other topography, such as the two bridges. When the Tideland Surveys, etc., were plotted on the chart, the picture was surprising; practically all of the Bay bottom, even that below mean lower low water through which Routes 105 and 107 pass, was privately owned, except the 1¼ miles on Route 105, and the 1,500 feet on Route 107 across the deep water channel.

Low Tide Lands

The veiled implication that a great deal of the Bay bottom below mean lower low water might be owned unethically should not disturb any one's blood pressure. The water is so shallow that thousands of acres are useless for navigation for vessels with a draft greater than that of a small tugboat. At low tide, if the Bay bottom was solid, a man could walk for a mile and a half northwest from the Toll Plaza and not get his shoulders wet; in fact he could walk from the shore line near the east end of the San Mateo Bridge for five miles westerly to the curve in the bridge with his head always out of water.

On the other hand, the ingenuity of industry has been converting this otherwise useless vast area to society's benefit. Table salt is one very useful by-product, and portland cement is another. There are millions of tons of oyster shells in the muds of the Bay from which the cement is made. This means tax revenue to the counties from the land and income tax to the Federal Government from the manufactured products; therefore, the status quo should be maintained. Oysters were also harvested for many years until the pollution of the Bay waters rendered them unfit for food. No, I don't own any stock in the salt or cement or oyster companies.

References

If you want more information about the Tide Land and Swamp and Overflow Lands Surveys, plan to spend a couple or three days (maybe more) in the San Francisco Law Library. Get Volume I of the Political Code of California of 1872, annotated, page 642, to use as a starting point, from whence you will wander through a maze of lawsuits and wind up with the answer, in general, that "tideland is that portion of a shore line that is periodically covered and uncovered by the waters of the ocean or a bay between mean higher high tide and mean lower low tide."

In *Randall* vs. *Caleb*, 32 Cal. 354, about 1860, the judge said, "Land periodically covered and uncovered by ordinary tides——." I haven't yet found a statutory definition of "tidelands"—maybe I haven't looked in the right book.

Let's take a look at T. 4 S., R. 3 W., M. D. B. & M. Our survey parties have done some excellent transbay triangulation and other surveying on the two bridges and adjoining highways, tying them together and reducing the data to the California Coordinate System. They also tied in the NE. corner monument of this township (in Alameda County) which has only one other corner monumented, the SW. in San Mateo County. Of the 36 sections in the township, only seven touch land and none are entirely on land. These two acceptable corners are not six miles apart along the cardinal bearings, being short by several hundred feet.

Monumented Section

There is another monumented section corner in the next township west, namely: the SE. corner of Sec. 23, T. 4 S., R. 4 W. This is an excellent point so far as it pertains to the land around it, southerly of the west approach in San Mateo County. It is also out of position with respect to the northeast corner of T. 4 S., R. 3 W., by about the same amount in the same direction.

Inasmuch as the Tide Land Surveys, Tide Land Locations and Swamp and Overflow Land Surveys are tied to land controls on opposite sides of the deep water channel, it seems reasonable that the adjustments can be made at those section corners that lie along the channel, near the center. This would continue the use of bearings and lengths of the various surveys along E. W. and N. S. lines, full miles or fractions thereof as written into the original descriptions.

The subdivision of this township is not yet concluded. It is understood, of course, that these boundary lines are purely theoretical, for paper use only. The water is too deep at high tide to set up a transit—just imagine chaining out a mile in 7 to 10 feet of water with a six-knot tidal current running across the line! Some good surveyors might get their feet wet.

Bearings Selected

To start the arithmetic from San Mateo toward Alameda County, it was first necessary to select a bearing. I had a choice of six along Third Avenue, and seven after getting around the first curve at the northeast end thereof. The decision to use the bearing of the State Highway Overhead Structure at Third Avenue and Bayshore seemed logical, as it would avoid a bearing equation, so it was adopted even though it differs somewhat from the bearings in pertinent deeds.

True bearings and adjusted ground distances were used, several traverses were run between the limits of the project before winding up inside the right of way. Once we landed clear out behind old Mrs. Jones' chicken coop; however, we finally came up with a good answer, and, strangely enough, without violating too severely the original descriptions of any of the individual parcels. In one case, two abutting parcels refused to "abut" by about 12 feet, and in another case the center lines of two parcels refused to collide headon—tried to by-pass each other by several feet; but slight adjustments rectified these conditions.

During the solving of this problem, a profound discovery was made; namely, that by using the proper bearing and the correct functions multiplied by the correct distances by properly handling the calculator, a correct answer resulted!!!! Nearly six months was required to make the record map; it *was* "a stinker," but an interesting one, comprising 18 plates.

Dumbarton Bridge and Approaches

This is Route SM-Ala-107-B, A, 6½ miles long, from Willow Road at the Southern Pacific Railroad right of way, Palo Alto, to Jarvis Road near Newark in Alameda County. It was purchased by the State in September, 1951, along with the San Mateo Bridge.

The characteristics of this project were quite different from the San Mateo Bridge R/W. The parcels were described by "leaps and mounds," as an old prospector friend of mine in Arizona once said. Most troublesome was the reduction to the California Coordinate System.

The franchise was granted under authority of San Mateo County Ordinance No. 330, dated 11/20/24, which also authorized the construction and the operation of the bridge; it also fixed the original tolls. There were no wagons of "10-ton capacity" listed, but some of the items for which tolls are collected were as follows: telephone message, ½ cent; telegraph messages, 1 cent; each 100 gallons of water, 1 cent; and 5 cents for each barrel of 42 gallons of oil. Many other items included wagons, autos, trucks, tricycles, motorcycles, etc. Exempt from paying tolls were "any persons going to or from a funeral, school, performing maintenance labor or attending a military parade or court of law he is required to attend as a witness in a criminal case."

There were several "gimmicks" in the right of way. The most puzzling was the 3,200 feet beginning at the northern Southern Pacific right-of-way line at the west end of the private road. The only document on record was a "Notice of Pendency of Action," which means that the land owners were going to be sued in condemnation for the right of way. The parcel desired for the roadway purposes was accurately described and was very nearly what the State now desires, even though it was written 25 years before the State made the purchase. The suit was never consummated.

There is an unrecorded agreement between the landowners and the bridge company, having a very casual description, such as: "* * * and extending in a uniform width of 200 feet northeasterly to a connection with a right of way granted by the Spring Valley Water Company to the bridge company, etc." The road was built clear outside of that one at one place.

Easement Granted

Meanwhile the Spring Valley Water Company had granted an easement in the shape of a parallelogram across its 100-foot right of way that is about 0.300 feet to the north of the railroad and across our right of way.

This easement fitted perfectly into the description of the "Notice to Condemn."

A couple of years later, the bridge company decided that the east half of this parallelogram was in the wrong place, so they prevailed upon the water company to trade it for a similar shaped and sized piece on the west side of the road. We found the piece that was on the east side, but is now on the west side, belongs to the east side. An effort is now being made to trade the piece that was on the east side and is now on the west side for a similar piece on the east side.

Condemnation Suit

This all happened in San Mateo County. The Alameda County side is quite different. The bridge company brought suit condemning the entire right of way from the east bridge end to Jarvis Road, describing the entire strip by metes and bounds. There were no references in any of the documents about the position of the center line of the right of way in relation to the center line of the roadway, and considerable difficulty was encountered along the easterly couple of thousand feet trying to make our survey line fit the right-of-way description.

I learned that the Resident Engineer on the construction of the bridge and roadway, a Mr. Frank M. Cortelyou, is now in Kansas City conducting his own consulting engineering practice. A letter to him got us some very helpful information, showing where the traveled way had been built. Its center line differed from the right-of-way center line by as much as 15 feet in places. Very shortly thereafter the record map had reached the checking stage—12 plates. It was a puzzling but interesting study.

In passing I can't help commenting a little about one deed that played a small part in this study, namely: the Spring Valley Water Company's deed to the City and County of San Francisco in 1930; this is a neat little book of 127 pages and averaging some 500 words per page. It covered about 100 parcels of land, easements, water rights, etc. One parcel contained 19,000 acres, the description of which contained some 7,000 words and would probably require 50 right-of-way traverse sheets to calculate!

RIGHT-OF-WAY GROUP

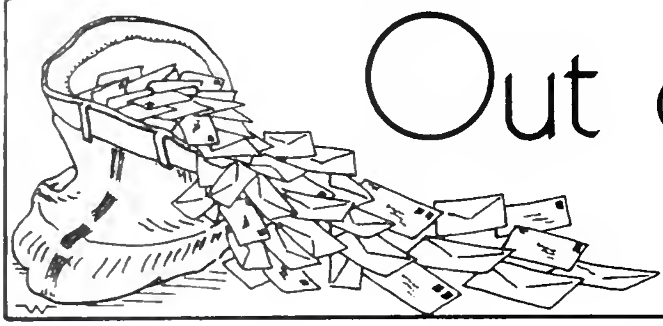
Continued from page 52 . . .

and John G. McGregor, Vice President of the Union Title Insurance and Trust Company, Secretary-Treasurer.

Honored guests attending the meeting included S. V. Cortelyou, Assistant State Highway Engineer, retired; F. E. Wallace, District Engineer, Division of Highways, District XI, San Diego; Judge L. N. Turrentine, Presiding Judge of the Superior Court of San Diego County; James A. Robbins, chairman of the Board of Supervisors, San Diego County; E. W. Blom, Assistant City Manager, San Diego; E. D. Sherwin, President, San Diego Gas & Electric Company; Lawrence T. Cooper, Assistant Vice President, The Pacific Telephone and Telegraph Company, Los Angeles; Commander E. G. Dobbins, Executive Officer, District Public Works Office, Eleventh Naval District; and Dr. Charles Lamden, Dean of Business Affairs, San Diego State College.

TRUCK TRANSPORTATION

Truck transportation creates employment directly for some 6,260,000 people in the United States, according to the National Automobile Club.



Out of the Mail Bag

FROM A PLANNING DIRECTOR

San Leandro, Calif.

Mr. Kenneth C. Adams, *Editor*

Dear Sir: I have found that *California Highways and Public Works* has been highly informative and a thoroughly enjoyable publication to read. I look forward to receiving it every two months.

Let me emphasize the value that this office places upon your publication. We find that it provides an excellent opportunity to keep in touch with the tremendous growth of our highway system in California.

Very truly yours,

George R. Volker
Planning Director
San Leandro

GRADUALLY CATCHING UP

THE UNION METAL MANUFACTURING CO.
Canton 5, Ohio

Mr. Kenneth C. Adams, *Editor*

Dear Mr. Adams: Your fine publication is read with interest each month by me and several others in our company who are familiar with California highways and are personal friends of many of those in that organization.

In addition to having a sizable manufacturing plant at Los Angeles, several of us are in California each year and have the pleasure of traveling over the excellent highways that you have built. We are anticipating more pleasure when you are finally able to catch up with the expressways needed for the millions of cars that travel them.

Sincerely yours,

W. A. Porterfield
Vice President
In Charge of Sales Promotion

GOING TO ISRAEL

Mr. Kenneth C. Adams, *Editor*

Dear Mr. Adams: I have been on your mailing list to receive the *California Highways* magazine since 1953. I read your publication with great interest while I was going to school at the University of California at Berkeley, and later, while I was a civil engineer with the Division of Highways, State of Illinois.

I now return to my home country, Israel, where I am going to assume a position with the Division of Highways there.

I will appreciate it very much if I could remain on your mailing list, and continue to receive this wonderful and interesting publication at my home address in Israel: 9 Joseph Haglili St., Ramat-Gau, Israel.

You may be assured that all copies received will be read with interest and with a searching eye to all the new developments in the highways field.

Yours very truly,

Un Fridman

NEW BOOSTER

CENTRAL MANUFACTURING DISTRICT, INC.
Los Angeles 58

Mr. Kenneth C. Adams, *Editor*

Dear Mr. Adams: I have just had the opportunity of seeing an issue of *California Highways and Public Works* and have thoroughly enjoyed reading it. It is one of the most interesting magazines of this type that has found its way across my desk.

If it is not inconsistent with your policies, it would be greatly appreciated if you could arrange to have this magazine sent regularly to our vice president, as I am sure it will from time to time contain articles of particular interest to our organization.

Very truly yours,

E. H. Farrar, Sales Manager

TWO LETTERS OF PRAISE

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
Inyo National Forest

November 1, 1954

Mr. Milton Harris
California Division of Highways
Bishop, California

Dear Mr. Harris: Please accept our thanks for the fine job your men from the Division of Highways did in helping to control the fire at Lee Vining on October 23d.

While we were unable to learn the names of all the men of your organization who helped out, we did note Chet Squires, Cliff Donnelly and Chuck Carter doing fine work.

Such help in time of need goes a long way to keep many of such fires from running wild and doing greater damage.

Very truly yours,

W. S. Davis
Forest Supervisor

LEE VINING VOLUNTEER FIRE DEPARTMENT
Lee Vining, California

November 3, 1954

Mr. Milt Harris, *District Engineer*
State Division of Highways
Bishop, California

Dear Sir: The use of personnel and equipment from District IX was greatly appreciated in helping us control and put out the fire in the Lee Vining Canyon area.

Chet Squires was in particular of great assistance to us in operating a bulldozer at great personal risk to himself. Roy Dondero also helped us a great deal; also Fred Wadley, Cliff Donnelly, and Frank Nolan.

Sincerely,

Victor Paranick
President

McCoy Becomes the President of A.A.S.H.O.

At its fortieth annual convention held in Seattle the American Association of State Highway Officials elected George T. McCoy, California State Highway Engineer as its president. McCoy, who has been first vice president of the association during the past year, succeeds A. E. Johnson of Arkansas.

McCoy has been Chief of the Division of Highways since January 4, 1943. He was named to the post of State Highway Engineer by the late Charles H. Purcell when Governor Earl Warren appointed Purcell State Director of Public Works.

Born in Milton, Oregon, September 12, 1889, McCoy was raised on cattle ranches in the Northwest and from early youth herded cattle and horses on the range. He graduated from Whitman College in Walla Walla, Washington, and later went east to Columbia University, New York City, where he completed a course in civil engineering in 1915.

Worked in Northwest

Meanwhile, in 1908, he joined the engineering staff of the United States General Land Office on work in the Cascade Mountains which included an irrigation project near the junction of the Snake and Columbia Rivers.

After his studies at Columbia University, McCoy was employed as assistant engineer on the great Catskill Aqueduct, which supplies New York City with water. His work was in bridge and dam construction and highway relocation in connection with the $300,000,000 project.

Returning to the Northwest, McCoy turned to highway engineering. He worked for the U. S. Bureau of Public Roads and the states of North Dakota, Idaho and Washington. Of the total of 10 years he spent in the State Highway Department of Washington, the last six, ending in 1927, were as Assistant State Highway Engineer.

Came to California

McCoy came to California in 1927 as Assistant Office Engineer in the Division of Highways. In the following year, when Purcell was appointed State Highway Engineer, McCoy became his administrative assistant. In 1933 he was advanced to the position of Assistant State Highway Engineer, becoming State Highway Engineer 10 years later.

Through active participation in the work of the American Association of State Highway Officials, McCoy achieved a wide reputation in the highway engineering field and is frequently consulted on problems of nation-wide scope. During the past year he has served as First Vice President of A. A. S. H. O., and also as a member of its Executive Committee and Chairman of the subcommittee on Highway Finance.

Commission Honors McCoy

At its meeting in San Francisco on November 17, the California Highway Commission adopted the following resolution:

WHEREAS, Mr. George T. McCoy, State Highway Engineer, has been elected and installed as the President of the American Association of State Highway Officials; and

WHEREAS, Mr. McCoy, by his long and effective service to this association, and by his elevation to this high office has brought honor and prestige not only to himself but also to the Department of Public Works and the Division of Highways of the State of California; now, therefore, be it

Resolved, That we, the members of the California Highway Commission, do hereby extend to him our congratulations and express our pleasure and appreciation that this association has recognized his ability and chosen him as its leaders for the ensuing year; be it further

Resolved, That this resolution be spread upon the minutes of this meeting of the California Highway Commission, and that an engrossed copy thereof be delivered to Mr. McCoy as a token of our esteem and appreciation of him as an executive, an engineer, a man, and a friend.

STEPPING STONES

Continued from page 31 . . .

necessitated by the change of alignment was subcontracted to the Los Gatos Construction Company. Approximately 80,000 cubic yards of clean sand of the type sold commercially as plaster or concrete sand, were excavated and placed in the embankment. The compaction of this material was obtained by ponding.

The sandy material was difficult to restrain within the proposed slope limits since it shifted laterally under the load of the heavy earthmoving equipment. Stakes set in the embankment after the completion of each five-foot layer indicated that the fill was too wide and the succeeding layer was stepped in to conform to the correct slope line. As this resulted in a series of narrow benches which invited erosion of the slopes the sides of the fills were struck off with a 90-pound rail about 25 feet long operated from the top of the fill by a Hyster crane.

Fill Stabilizotion

At one location on the project the new road was paralleled by a small creek sufficiently close to endanger the stability of the fill. Since the creek was confined within a deep gorge a channel change was unfeasible so a 48-inch reinforced concrete pipe 200 feet long was placed in the creek bed, and the embankment construction was extended over the creek and pipe.

At another location the proximity of the same creek did not allow sufficient space for a fill to be constructed. A rubble masonry wall, constructed from slabs broken from the old concrete pavement, was built for a length of 100 feet paralleling the center line at a distance of 17 feet. The wall varied from 8 to 10 feet in height including a 1-foot 6-inch parapet.

The eighth project of the county's FAS highway improvement program is the replacing of the Hester Creek Bridge on the old Soquel-San Jose Road with a box culvert and embankment, involving realignment of 0.303 miles of road. The planning and designing is now complete and the project has been submitted for advertising.

State Highway Contracts Awarded

AUGUST, 1954, AWARDS

Alameda County—US 50—At the intersection of Foothill Blvd. with Carolyn St., at 159th Ave., about 2.0 miles southeast of San Leandro. Construct a left storage lane of plant mixed surfacing and penetration treatment on untreated rock base. Awarded. O. C. Jones & Sons, $4,706.

Alameda County—US 50—In the vicinity of the San Francisco-Oakland Bay Bridge Toll Plaza, in the City of Oakland. Construct a sand fill embankment and place riprap slope protection, 1.0 miles. Awarded Hydraulic Dredging Co., Ltd., $703,361.55.

Alameda County—Eastshore Freeway—On Eastshore Freeway between Market St. and 11th St. Construct a portion of a bridge with reinforced concrete spans on reinforced concrete abutments and bents and construct a reinforced concrete pedestrian undercrossing, perform roadwork consisting of construction of graded roadbeds and placement of pavement and surfacing with plant-mixed surfacing, completion of construction to be performed under a future contract, 0.8 mile. Awarded Fredrickson & Watson Const. Co. and M & K Corp., $1,659,774.50.

Alameda, Contra Costa, Marin, Sonoma Counties—At various locations—Apply seal coat to existing surfacing, 15.5 miles. Awarded J. Henry Harris, $21,-996.40.

Del Norte County—US 101—Between Elk Valley Rd. and north city limits of Crescent City (portions). Scarify and reshape the existing roadbed, place imported base material, construct cement treated base, place plant mixed surfacing and apply a seal coat and construct reinforced concrete drainage structures, 0.5 mile. Awarded Paul E. Woof, $36,249.

Fresno County—Between Teilman Ave. and Princeton Ave., in the City of Fresno. Furnish and install highway lighting systems at eight locations. Awarded Robinson Electric, $36,010.05.

Fresno, Kings, Tulare and Kern Counties—At various locations. Apply seal coats to the existing surfacing, 63.1 miles. Awarded Rand Construction Co., $68,042.50.

Humboldt County—US 101—On Main St. between 13th St. and Eighth St. Adjust three drainage structures, remove sections of concrete pavement and nine inches of material thereunder, place portland cement concrete pavement on imported base material and surface with plant-mixed surfacing, 0.1 mile. Awarded Paul E. Woof, $6,940.

Humboldt County—US 101—Between 0.3 mile south of south city limits of Arcata and 17th St. Reshape the existing shoulders and apply penetration treatment and place plant-mixed surfacing on the existing traveled way, 1.1 miles. Awarded Mercer Fraser Co. and Mercer Fraser Gas Co., Inc., $13,642.

Imperial County—US 99—Between 1 mile west of Brawley and Trifolium Canal in Westmorland. Grade the existing shoulders, backfill with imported subbase material and imported base material, place plant mixed surfacing over the existing surfacing and new shoulders and apply seal coats, 12.9 miles. Awarded Fredricksen & Kasler, $333,333.32.

Inyo County—FAS 1184—Across Owens River, about 4 miles north of Bishop. Construct a reinforced concrete bridge. Awarded Frunt Construction Co., [illegible].

Kings County—SR 41—At the north fork of Kings River Overflow, about 6 miles north of Lemoore. Replace timber bridge with a reinforced concrete culvert and grade and apply bituminous surface treatment to the detour. Awarded Gene Richards, Inc., [illegible].

Los Angeles County—Between Gower St., and Hollywood Blvd. in the City of Los Angeles. Prepare and plant roadside areas, 0.4 mile. Awarded Lloyd Matthew Co., $17,171.62.

Los Angeles County—Between Fremont Ave. and Walnut Grove Ave. (portions). Prepare and plant roadside areas, 0.9 mile. Awarded Stephan L. Vistica, $66,480.35.

Los Angeles County—SR 138—Between 2 miles east of Neenach School and US 6 (portions). Construct a graded roadbed and place imported base material, a selected material from roadway excavation, apply a bituminous surface treatment; widen and resurface the intersection at US 6 with plant-mixed surfacing; apply seal coats to the surfaced roadbeds; and install drainage facilities, 6 miles. Awarded Lowe & Watson, $251,166.20.

Los Angeles County—At the intersections of Mayall St. and Tupper St. with Sepulveda Blvd., in the City of Los Angeles; construct median openings and channelization at two intersections. Awarded Schroeder & Co., $7,302.

Los Angeles County—On Manchester Blvd. between Grevillea Ave., and Prairie Ave., in Inglewood, widen the existing roadbed with cement treated base on imported subbase material; placing plant-mixed surfacing over the existing pavement and widen roadbed; reconstructing an existing traffic signal system and installing an intersection lighting system at the intersection of Manchester Blvd. and Prairie Ave., 0.8 mile. Awarded Griffith & Co., $90,562.

Los Angeles, Ventura, and Orange Counties—At various locations. Apply seal coat to the existing surfacing, 53.8 miles. Awarded, Geiser Const. Co., $71,893.

Marin County—US 101—At Richardson Bay about 5 miles north of San Francisco. Place embankment and grade and surface a four-lane detour with plant-mixed surfacing, install highway lighting and illuminated signs and construct a reinforced concrete bridge at Richardson Bay Bridge and Overhead, 1.0 mile. Awarded The Duncanson-Harrelson Co. and Pacific Bridge Co., $3,017,427.

Marin County—At Mt. Tamalpais State Park, between Pan Toll Junction and West Peak. Apply bituminous surface treatment and seal coat to the existing roadway, 2.7 miles. Awarded Paul E. Woof, $14,495.

Mariposa County—FAS 963—On Bootjack Rd. from Mormon Bar to 1 mile easterly. Construct a graded roadbed and surface with plant-mixed surfacing on cement treated base, 0.9 mile. Awarded R. T. Maxwell, $2,747.

Mono County—SR 108—Between Pickel Meadows and junction US 395, about 17 miles north of Bridgeport. Widen the existing roadbed and surface with road-mixed surfacing on untreated rock base, 5 miles. Awarded Pyramid Construction Co., $97,716.

Napa County—SR 37—Between 2.1 miles east of the Sonoma County line and 2.2 miles east of the Carneros School. Construct a graded roadbed, place plant mixed surfacing on untreated rock base and existing pavement and apply seal coats, and construct a reinforced concrete bridge across Carneros Creek, 2.7 miles. Awarded Arthur B. Siri, Inc., $378,742.90.

Nevada County—SR 20—At three intersections in and near Nevada City. Place untreated rock base and plant-mixed surfacing on portions of the existing roadway and apply penetration treatment to portions of the shoulders. Awarded John G. Mehren, $7,-462.50.

Orange and Los Angeles Counties—On La Habra Rd., between Grand Ave. and 0.2 mile south of Imperial Hwy. Construct a graded roadbed placing imported subbase material and plant-mixed surfacing on untreated rock base, apply seal coats and construct a reinforced concrete bridge over Coyote Creek, 2.9 miles. Awarded Cox Bros. Const. Co., $231,933.60.

Placer County—US 40—In the vicinity of Flood Rd., about 0.6 mile north of Auburn. Grade and surface a frontage road with plant-mixed surfacing. Awarded Lester L. Rice & Sons, $8,280.

Placer County—FAS 767—Across North Fork American River, between SR 65 and 0.44 mile east, about 3 miles northeast of Auburn. Construct a steel bridge with reinforced concrete deck and grade approaches, placing untreated rock base and surfacing with road mixed surfacing, 0.4 mile. Awarded James B. Allen, $206,828.

Plumas County—FAS 1200—Across Hamilton Branch, about 0.5 mile east of Lake Almanor. Construct a reinforced concrete and steel bridge. Awarded J. B. Allen, $119,437.

Sacramento County—At the intersection of Rt. 98 with C St., and at the junction of Rt. 98 with Rt. 3. Furnish and install highway lighting and illuminated sign systems. Awarded Reliable Elevator Works, $36,766.

San Bernardino County—At the intersection of I St. with Third St. in Colton. Install complete in place a full traffic-actuated signal system and highway lighting. Awarded Drury Electric Co., $9,955.

San Bernardino County—SR 18—Between Central Rd. and 1.3 miles east of Victorville. Apply bituminous surface treatment and seal coats, 6.9 miles. Awarded P & F Construction Co., $24,838.50.

San Bernardino County—Rt. 188—Between Camp Seeley and Cedar Springs. Apply bituminous surface treatment to the existing roadbed, 7 miles. Awarded Lowe & Watson, $19,924.

San Francisco County—SR 1—Golden Gate Bridge approach between the Toll Plaza and junction of SR 56. Widen the roadbed placing untreated rock base and portland cement concrete base and surface with plant-mixed surfacing on existing pavement, and widen the two existing reinforced concrete bridges at Lincoln Blvd. undercrossing and Marina approach overcrossing, 0.5 mile. Awarded The Lowrie Paving Co., Inc., $265,531.40.

San Joaquin, Calaveras, Amador, Sacramento, Solano, Tuolumne, and Stanislaus Counties—At various locations. Apply seal coat to the existing surfacing, 59.7 miles. Awarded Claude C. Wood Co., $54,198.

San Joaquin County—SR 4—At the intersection of Charter Way with Marengo Rd. in Stockton. Install highway lighting. Awarded R. Goold & Son, $2,525.

San Mateo County—Eastshore Freeway—Between 1 mile and 1.9 miles south of the San Francisco-San Mateo County line. Construct a graded roadbed to provide a future four-lane divided roadway on new alignment, 0.9 mile. Awarded Guy F. Atkinson Co., $1,288,816.

San Mateo County—Rt. 107—At Dry Creek in Woodside. Erect plate culvert extensions, construct reinforced portland cement concrete head walls and end walls and widen shoulder embankments. Awarded O. C. Jones & Sons, $9,291.70.

Santa Barbara, San Luis Obispo and Monterey Counties—At various locations. Apply seal coat to the existing surfacing, 67.2 miles. Awarded Bickmore Harper, Inc., and Contractors Equipment Rental Service, $88,844.15.

Santa Clara, Santa Cruz, and San Mateo Counties—At various locations—Apply seal coats to the existing roadway, 26.1 miles. Awarded Granite Constr. Co., $48,717.80.

Santa Clara County—SR 17—At the intersection of W. San Carlos St. with Wabash Ave.-Leland Ave., adjacent to the City of San Jose. Construct median lanes and install traffic signal system. Awarded Howard Electric, $22,845.50.

Santa Clara County—At Main St., Los Gatos. Construction of a reinforced concrete bridge and culvert and a combination timber and structural steel bridge, which provides the Main St. Overcrossing, the Los Gatos Creek Culvert and the Main St. Detour Bridge, 0.3 mile. Awarded Carl N. Swenson Co., Inc., $353,477.50.

Shasta County—US 99—Between Clear Creek and Hill St. in Redding. Apply seal coats, 4.2 miles. Awarded Donald Graves, $9,220.

Shasta County—US 99—Across Dog Creek, about 27.5 miles north of the north city limits of Redding. Construct a reinforced concrete bridge. Awarded B. J. Ukropina, T. P. Polich, Steve Kral and J. R. Ukropina, $737,020.

Siskiyou County—US 99—Between Dunsmuir and Big Canyon. Apply seal coat to the traveled way and shoulder areas and road connections, 4.2 miles. Awarded Morgan Construction Co., $22,239.

Siskiyou County—FAS 1166—Between SR 3 and Four Corners, about 7.2 miles east of Grenada. Shape the existing roadway and place plant-mixed surfacing, 7.8 miles. Awarded Rice Brothers, Inc., $118,505.

Solano County—Between Arroyo Grande and Pismo Beach—Grade roadbeds, place selected material and imported base material, construct cement treated subgrade and base and surface with portland cement concrete pavement and plant-mixed surfacing and construct five reinforced concrete bridges; providing a four-lane divided highway with Brisco Rd. Undercrossing, Oak Park Overcrossing, Pismo Oaks Overcrossing, Pismo Overheads, and the Villa Creek Bridge, all on new alignment, 3.5 miles. Awarded Madonna Construction Co., $1,598,111.05.

Stanislaus County—SR 33—At Puerto Creek Bridge, about 2.7 miles north of Patterson. Remove the existing concrete bridge railing, replacing with corrugated metal bridge railing and construct metal plate guard railing along the approaches to the bridge. Awarded H. Sykes, $2,838.30.

Sutter County—FAS 926—Between Sacramento county line and 1 mile south of Striplin Rd. Construct cement treated base, place plant-mixed surfacing on the traveled way, construct shoulders of imported base material and apply penetration treatment, 7.8 miles. Awarded Baldwin Contracting Co., Inc., $115,169.90.

Tehama County—SR 36—Between junction Rt. 3 and Paynes Creek Bridge (portions). Place plant-mixed surfacing on cement treated base, 7.2 miles. Awarded Rice Brothers, Inc., $184,433.10.

Trinity County—FAS 1089—Between Costa Ranch and 1.9 miles east, about 8 miles northeasterly of Weaverville. Construct a graded roadbed and install drainage facilities, 1.9 miles. Awarded M. W. Brown, $67,371.

Tulare County—Between west city limits of Tulare and D St. in Tulare. Apply bituminous surface treatment to the existing shoulders. Awarded Irv. Guinn, $3,243.

Yolo County—SR 90—Between 2.7 miles and 6.7 miles north of Madison. Construct a graded roadbed and place plant-mixed surfacing on cement treated base and untreated rock base and construct a reinforced concrete bridge, 4.1 miles. Awarded Fredrickson Bros., $333,110.10.

SEPTEMBER, 1954, AWARDS

Alameda County—On E. 14th St. between Durant Ave. and 46th Ave. in the City of Oakland. Plane the existing asphalt concrete pavement with a heater planer device, excavate and replace failed areas and place plant-mixed surfacing over the existing pavement, 3.7 miles. Awarded to Independent Constr. Co., $109,692.

Alameda and San Joaquin Counties—US 50—Between 2 miles east of Redmond Overhead and the west city limits of Tracy (4 locations). Install highway lighting systems at one highway interchange, two road intersections, and at the Southern Pacific Railroad Crossing. Awarded to Collins Electrical Co., $13,258.

Alpine County—FAS 960—Between Springmeyer Ranch and SR 24 at Payneville. Construct a graded roadbed and surface with road-mixed surfacing on imported base material, 2.7 miles. Awarded to Claude C. Wood, $80,545.54.

Amador County—SR 88—Between Pine Grove and Cooks Station (portions). Place plant-mixed surfacing on the existing pavement and apply seal coat, 11.5 miles. Awarded to Granite Construction Co., $113,240.

Butte County—SR 45—Between 0.2 mile east of Cherokee Canal and junction of US 99-E. Place imported subbase material, plant-mixed surfacing on cement treated base and apply seal coat on existing roadway, 2.7 miles. Awarded to Baldwin Contracting Co., $83,195.70.

Butte County—FAS 1169—Between Oroville-Quincy Hwy. and US 40 Alt. (at Acacia Ave.). Construct graded roadbed by placing imported subbase material, untreated rock base, surface with plant-mixed surfacing, apply penetration treatment and seal coat to shoulders and construct traffic islands and concrete curbs, 0.7 mile. Awarded to Baldwin Contracting Co., $53,445.37.

Colusa County—SR 45—Between 3.2 miles and 1.8 miles south of Grimes. Widen the existing roadbed with imported base material and apply seal coat, 1.4 miles. Awarded to Lester L. Rice & Sons, $8,393.

Del Norte County—US 101—Between 14.3 miles and 23.8 miles northeast of Crescent City, along the Smith River (portions). Construct graded roadbed, place plant-mixed surfacing on imported base material and construct grouted imported rock slope protection; construct a channel of portland cement concrete, 0.5 mile. Awarded to Arthur B. Siri, Inc., $58,354.50.

Fresno County—FAS 815—Across Central Canal and Fowler Switch Canal, between Calwa and Sanger. Construct two reinforced concrete bridges. Awarded to Kaweah Construction Co., $30,607.98.

Humboldt County—US 101—At 1.5 miles north of Miranda. Remove three redwood trees and widen the roadbed, placing imported base material on the widened area and surface with plant-mixed surfacing. Awarded to Paul E. Woof, $9,488.50.

Humboldt County—US 101—About 15.3 miles north of Garberville; about 8.5 miles south of Scotia; and in Rockefeller Grove State Park, about 4.1 miles west of Dyerville. Make minor grade and line changes, surface the graded areas with plant-mixed surfacing or penetration treatment and construct pile bent jetty and light stone riprap bank protection, restoring the roadway embankments. Awarded to Mercer, Fraser Co. and Mercer, Fraser Gas Co., Inc., $97,520.

Humboldt County—US 101—At Redwood Creek Bridge in the Town of Orick. Reinforce an existing concrete pile bent on the Redwood Creek Bridge. Awarded to John W. S. Petersen, $2,440.

Humboldt County—FAS 501—At Ryan Slough. Construct a reinforced concrete and a timber bridge, and grade the approach roadways, placing plant mixed surfacing on cement treated base and existing surfacing, 0.5 mile. Awarded to Mercer, Fraser Co. and Mercer, Fraser Gas Co., $95,965.75.

Humboldt County—FAS 969—Between 1.4 miles northwesterly of the north city limits of Arcata and US 101 near Mad River. Construct a graded roadbed and place plant-mixed surfacing on imported base material and apply seal coats, 1.3 miles. Awarded to Mercer, Fraser Co. and Mercer, Fraser Gas Co., $67,263.

Imperial and Riverside Counties—US 99 and US 60, 70—Between Trifolium Canal and 1 mile north of Oasis, and between 8.4 miles east of junction US 99 and 7.9 miles west of Black Butte. Construct metal plate guard railing. Awarded to Milleman-Sooey & Jackson, $32,414.50.

Inyo County—US 395—At new State Highway District Office on S. Main St. Develop and plant surrounding areas and construct portland cement concrete curbs and sidewalks, drives and parking areas to be paved with road-mixed surfacing. Awarded to K. F. C. Company, $23,446.75.

Kern and Mono Counties—SR 58, 23 and 95—At various locations. Construct guard railing. Awarded to Fredericksen & Kasler, $15,400.

Kern County—SR 212—Between 0.9 mile west of Naval Ordnance Test Station Gate and 1.4 miles east of Ridgecrest. Widen the existing roadway by constructing graded roadbeds and placing plant-mixed surfacing on cement treated base, 4.3 miles. Awarded to Basich Bros., $110,196.50.

Kern County—SR 178—Between east city limits of Bakersfield and Horace Mann Ave. Grade the north gutter and pave with plant-mixed surfacing on cement treated base, 1.2 miles. Awarded to Griffith Company, $20,988.75.

Kern County—SR 142—At Isabella Reservoir. Grade road approaches and parking area and apply a bituminous surface treatment. Awarded to Phoenix Construction Co., Inc., $3,904.

Lake County—SR 20—About ½ mile east of Upper Lake. Grade and surface with plant-mixed surfacing the existing roadway and replace existing bridge by constructing a reinforced concrete bridge. Awarded to Walter H. Lindeman, $12,425.

Lake County—FAS 1039—Between SR 49 at Lower Lake and 1.2 miles westerly. Construct a graded roadbed, place imported subbase material and imported base material, and apply seal coat, 1.2 miles. Awarded to Melvin W. Oldham & Harold P. Hastings, $34,081.10.

Los Angeles County—On the Ramona Freeway between Rosemead Blvd. and the San Gabriel River. Completion of this contract will provide a four-lane divided highway with separation structures all on new alignment. The road work consists of grading and surfacing with portland cement concrete over imported base material. Reinforced concrete bridge construction at: Eaton Wash-Frontage Rd.; Eaton Wash; Eaton Wash-Pacific Electric Railway; Baldwin Ave. Undercrossing and Underpass; Eaton Wash-Baldwin Ave. Retaining Walls; Baldwin Ave. Undercrossing and Underpass Pump Plant; Gibson Overhead; Rio Hondo Bridge; Rio Hondo Maintenance Undercrossing; Lexington Ave. Undercrossing; Tyler Ave. Undercrossing; Utah Ave. Pedestrian Undercrossing; Meeker Rd. Undercrossing; Exline Ave. On-Ramp Undercrossing; Cogswell Rd. Undercrossing; Durfee Rd. Undercrossing; Garvey Ave. Off-ramp Undercrossing; and structural steel bridge construction at: Peck Rd. Undercrossing; Rt. 26-77 Separation; E. El Monte Overhead, 3.9 miles. Awarded to Peter Kiewit Sons Co., $5,960,241.70.

Los Angeles County—Alt. US 101—Between west city limits of Torrance and Hawthorne Ave. Widen the existing roadbed and surface with plant mixed surfacing on cement treated base to provide a four-lane divided highway, 2.4 miles. Awarded to J. E. Haddock, $148,388.50.

Los Angeles County—On Sepulveda Freeway—Between Kiel St. and Ovada Pl. Graded roadways, frontage roads and ramps, surfaced with plant-mixed surfacing on untreated rock base and reinforced concrete bridges at: Sunset Blvd.-Sepulveda Blvd. Separation, Sunset On-ramp. Awarded to George W. Peterson & Jack W. Baker, $722,657.60.

Los Angeles County—In and adjacent to the Cities of Monterey Park and Montebello on Pomona Blvd. between Hillview Ave. and Wilcox Ave. Install and modify traffic signal systems and highway lighting at six locations. Awarded to Electric & Machinery Service, $32,296.

Mariposa County—SR 140—Between 6.3 miles and 4.2 miles west of Mariposa. Widen existing cuts, excavate border trenches, and place plant-mixed surfacing on untreated rock base and existing surfacing, 2.1 miles. Awarded to R. E. Maxwell, Jr., $130,-367.75.

Mendocino County—Access Road—Between Garcia River and 3.8 miles easterly. Scarify and reshape existing roadbed, apply seal coat and prime coat, 3.8 miles. Awarded to Arthur B. Siri, Inc., $14,338.

Merced County—FAS Rts. 555 and 1057—On Plainsburg Rd. between SR 140 and on Le Grand Rd. between Plainsburg Rd. and US 99. Construct graded roadbed and place plant-mixed surfacing on untreated rock base and existing pavement, 7.7 miles. Awarded to M. J. Ruddy & Son, $218,134.45.

Modoc County—FAS 1192—Between N Canal and Oregon state line, near Kandra Railroad Station. Scarify and reshape the existing roadbed and surface with plant-mixed surfacing, 12 miles. Awarded to Donald Graves, $172,092.

Napa County—FAS 607—Between 0.5 mile north of Soda Canyon Rd. and Oak Knoll Ave., on Silverado Trail. Construct a graded roadbed, place imported borrow and untreated rock base, and apply seal coat, 0.7 mile. Awarded to Albert J. Snodgrass, $30,458.30.

Nevada County—SR 49—Between Uren St. and near northwest city limits of Nevada City. Prepare and plant roadside area for erosion control, 1 mile. Awarded to Justice-Dunn Co., $6,128.50.

Orange County—Alt. US 101—Between the north city limits and the south city limits in the City of Newport Beach, on the Pacific Coast Hwy. Widen the roadbed and surface with plant-mixed surfacing on untreated rock base, reconstruct the existing traffic signal systems and intersection lighting and install a traffic signal interconnect conduit, 1.4 miles. Awarded to Cox Bros. Constr. Co., $265,535.

Orange County—SR 175—Between Cypress Ave. and Rt. 43 near the City of Fullerton (portions). Grading, placing imported subbase material and untreated rock base, surfacing with plant-mixed surfacing and constructing bridges at Rt. 175/43 separation and at N. Olive Underpass, to provide a four-lane divided highway together with interchange roadways, accelerating and decelerating lanes and frontage roadway, 4.0 miles. Awarded to Ukropina-Polich-Kral, $1,061,539.

Placer County—US 40—Between 1 mile west of Applegate and Heather Glen. Grade roadbeds and place plant-mixed surfacing on cement treated base, to provide a four-lane divided highway, and grade and surface detour roads and road connections, 2.7 miles. Awarded to Piombo Construction Co., $623,573.25.

Riverside County—US 95—At the D Canal and at the C Canal. Construct a graded roadbed, place imported base material and surface with road-mixed surfacing and construct two reinforced concrete bridges at C Canal and at D Canal, 0.9 mile. Awarded to Silberberger Constructors, Inc., & J. B. Stringfellow, $129,385.15.

San Bernardino and Riverside Counties—At various locations. Apply seal coats to the existing surfacing, 54.9 miles. Awarded to Matich Bros., $61,211.

San Bernardino County—US 70, 99—At Archibald Ave. and Etiwanda Ave. Construct a graded roadbed for two traffic interchanges and place plant-mixed surfacing on imported base material and existing surfacing and construct two steel bridges at Archibald Ave. Overcrossing and at Etiwanda Ave. Overcrossing and widen the bridge at the Etiwanda Wash. Awarded to W. F. Maxwell, $497,872.70.

San Diego County—US 101—Between Mexican border and 13th St. in National City. Install complete in place highway lighting at seven locations. Awarded to Ets-Hokin & Galvan, $28,659.

San Diego County—US 80—Between 0.4 mile east of Alpin and Descanso Junction (portions). Place plant mixed surfacing over the existing surfacing and apply seal coats, 1.8 miles. Awarded to Daley Corp., $34,301.25.

San Diego County—SR 67—Between Palm Ave. and Fourth St. in the City of La Mesa. Place plant-mixed sorfacing on the existing roadway, 0.2 mile. Awarded to Daley Corp., $1,788.

San Francisco and Alameda Counties—On lower deck of the San Francisco-Oakland Bay Bridge. Construct colored lamp traffic control system. Awarded to Chas. A. Langlais Co., $505,570.45.

San Joaquin County—FAS 901—On Elliot Rd., across Mokelumne River and Mokelumne Overflow near Lockeford. Construct a structural steel and reinforced concrete bridge across the Mokelumne River and a reinforced concrete slab bridge across the Mokelumne Overflow, 1.3 miles. Awarded to Brighton Sand & Gravel and R. M. Skamnes, $174,329.95.

San Luis Obispo County—SR 125—Between Salinas River near Atascadero and 3.1 miles easterly. Apply penetration treatment to the existing surfacing, 3.1 miles. Awarded to Valley Paving and Constructing Co., $997.50.

San Luis Obispo County—FAS 681—Between 0.6 mile and 3.5 miles east of Arroyo Grande, on Upper Arroyo Grande Rd. Construct a graded roadbed, place selected material and imported base material and place plant-mixed surfacing, 2.9 miles. Awarded to E. L. Webb Construction Co., Inc., $105,528.10.

San Mateo County—Bayshore Freeway—At Millbrae Ave. and at San Bruno Rd. Clean and paint two steel bridges. Awarded to George C. Punton, $18,190.

Santa Barbara County—US 101—Between 1 mile north of summit and ½ mile south of Santa Ynez River. Construct six reinforced concrete bridges and construct graded roadbeds and pave with portland cement concrete on cement treated subgrade and plant-mixed surfacing on cement treated base, to provide a four lane divided roadway with frontage roads and crossovers, 4.1 miles. Awarded to B. J. Ukropina, T. P. Polich, Steve Kral, John R. Ukropina and Madonna Construction Co., $1,923,764.

Santa Barbara County—US 101—Between 1 mile east of Orella and 1 mile west of Refugio. Place plant-mixed surfacing on existing pavement and shoulders, and apply seal coats, 2.8 miles. Awarded to A. J. Diani Construction Co., $47,223.

Santa Cruz County—SR 1—Between north city limits of Santa Cruz and the San Mateo County line. Construct reinforced concrete drainage structures. Awarded to Granite Construction Co., $13,527.20.

Sierra County—FAS 524—Between 2.5 miles and 0.5 mile west of Loyalton. Place plant-mixed surfacing on existing base, 2 miles. Awarded to Munn & Perkins, $22,455.

Siskiyou County—US 99—At Four Intersections in North Dunsmuir. Install complete in place highway lighting systems. Awarded to Hall-Sloat Electric Co., Inc., $7,956.

Solano County—SR 7, 74 and 90—On State Highway Rt. 7 at the intersections of Rts. 74 and 90, Tennessee St., Magazine St., Buss St., Georgia St. and White Sulphur Springs Rd. Install complete in place highway lighting at two locations, advance flashing beacons at two locations, semiactuated traffic signal systems at five intersections with over-all master control by a traffic actuated cycle and offset selector mechanism and revision of one two-phase traffic-actuated signal system to a three-phase traffic-actuated signal system. Awarded to Hall-Sloat Electric Co., Inc., $46,484.

Solano, San Joaquin, Stanislaus, Merced and Mariposa Counties—At various locations. Apply seal coats to the existing surfacing, 48.7 miles. Awarded to Granite Construction Co., $48,749.50.

Solano County—SR 48—Across Napa River at Vallejo. Reconstruct the existing timber trestle bridge with new stringers and caps and stubbing pile bents with new materials. Awarded to Healy-Tibbitts Construction Co., $29,320.

Solano County—FAS 1109—Between US 40 and west city limits of Dixon. Construct graded roadbed with imported subbase material and place plant-mixed surfacing on untreated rock base, 1.4 miles. Awarded to Fredrickson Bros., $69,860.20.

Sonoma and Solano Counties—SR 48—Across Sonoma Creek about 10 miles west of Vallejo. Reconstruct an existing timber trestle bridge. Awarded to Morison Const. Co. and T. Schwartz, $14,960.

Sonoma County—SR 12—Between 0.16 mile north of Warfield Station and Stuart Creek. Place imported borrow and untreated rock base, surface with plant-mixed surfacing aod apply seal coats and penetration treatment, 0.23 mile. Awarded to Allied Paving, $15,807.

Sonoma County—FAS 777—On Bay Hwy. between 3.5 and 5.7 miles westerly of Valley Ford. Construct graded roadbed, place imported base material on processed selected material, seal coat and penetration treatment, partially on new alignment, 2.2 miles. Awarded to Huntington Bros., $170,000.

Stanislaus County—US 99—Between Hatch Rd. and Modesto. Grade a four-lane divided highway and surface with plant-mixed surfacing on untreated rock base and existing pavement and widen the existing steel bridge, 1.8 miles. Awarded to Granite Construction Co., $635,014.

Stanislaus County—FAS 1209 and 1210—Between US 99 and Geer Rd. on Keyes Rd.; between north city limits of Turlock and Santa Fe Ave., on the Turlock-Denair Rd. Widen the existing roadbed and place plant-mixed surfacing on untreated rock base; seal coat and penetration treatment are to be applied to the shoulders, 6.6 miles. Awarded to Standard Materials, Inc., $136,829.25.

Tehama County—SR 36—Across South Fork Cottonwood Creek about 15 miles west of Red Bluff. Construct two supplementary steel bents on reinforced concrete footings for the end steel beam spans of an existing bridge. Awarded to R. E. Hertel, $2,147.50.

Tulare County—FAS 1130—On Cairns Ave., between FAS 1134 about 4 miles west of Strathmore and junction of SR 134. Construct a graded roadbed and place imported base material, cement treated base, and plant-mixed surfacing, 5 miles. Awarded to Baldwin Contracting Co., $171,926.12.

OCTOBER, 1954, AWARDS

Alameda and San Mateo Counties—On six locations on the Eastshore and Bayshore Freeways. Maintenance buildings to be constructed. Awarded to Bos Construction Co., $13,089.20.

Alameda County—In the City of Oakland at the intersections of Fifth and Sixth Streets between Oak and Jackson Streets. Modifying traffic signal systems. Awarded to Hall-Sloat Electric Co., Inc., $3,380.

Alameda County—In the City of Berkeley on Ashby Avenue between Ninth Street and San Pablo Avenue. Widening of existing pavement, 0.1 mile. Awarded to Ransome Co., $8,404.

Glenn County—In City of Willows at the intersections of Tehama Street. Traffic signals and highway lighting. Awarded to L. H. Leonardi Const. Co., $17,091.

Humboldt County—At Richardson Grove State Park. Place imported borrow and road-mixed surfacing and apply a seal coat to portions of the existing road and install metal pipe culverts. Awarded to Paul E. Woof, $6,417.50.

Kern County—SR 142—Between Beardsley Avenue about one mile north of the north city limits of Bakersfield and 0.6 mile north of China Grade Loop, 2.2 miles. Construct graded roadbed, place plant-mixed surfacing on cement treated base, and existing pavement and widen existing reinforced concrete bridge; install traffic signal systems and highway lighting. Awarded to Dicco, Inc., $288,682.25.

Lassen County—Between 9.5 miles north of Secret Valley and Ravendale. To be graded and surfaced with plant-mixed surfacing on untreated rock base, 7.3 miles. Awarded to Harns Bros., $406,339.68.

Los Angeles County—On Hollywood Freeway between Barham Boulevard and Cahuenga Boulevard in the City of Los Angeles. Developing and planting of roadside and median area. Awarded to K. E. C. Co., $73,507.24.

Orange County—At Huntington Beach State Park and at Doheny Beach State Park. Parking areas to be surfaced with plant-mixed surfacing on untreated rock base. Awarded to Sully-Miller Contracting Co., $13,400.43.

Riverside County—US 60—At Wineville Underpass about 8 miles southeast of Ontario. Plant-mixed surfacing, 0.3 mile. Awarded to George Herz & Co., $2,208.50.

Riverside County—US 60, 70, 99—Between 22d Street in Banning and one-half mile east of Banning. Four bridges and embankments are to be constructed and bridge sites to be graded. Awarded to J. A. Thompson & Son, $258,995.

Riverside and San Bernardino Counties—At various locations. Plant-mixed surfacing to be placed on existing roadway, 9.6 miles. Awarded to Herz Paving Co., $53,937.25.

San Bernardino County—US 91—Between State Street and one mile south of Verdemont Underpass. Bituminous surface treatment to be applied to shoulders, 3.2 miles. Awarded to Matich Bros., $11,805.

San Diego County—In the City of San Diego, at the intersections of Rosecrans Street with Midway Drive and with Camino Del Rio-Frontier Street. Modification of traffic signal system and highway lighting and installation, construction of channelization. Awarded to California Electric Works, $29,204.35.

San Joaquin County—SR 88—Across Mokelumne River, near Clements. Portions of the existing bridge to be redecked. Awarded to C. C. Gildersleeve, $3,580.20.

San Mateo County—On the Bayshore Freeway between South San Francisco and San Francisco. Plant-mixed surfacing to be placed on existing pavement, 2.3 miles. Awarded to L. C. Smith Co., Inc., $59,921.

Santa Clara County—At the intersection of El Camino Real with Page Mill Road in the City of Palo Alto. Traffic signal systems and highway lighting to be furnished and installed. Awarded to Howard Electric Co., $8,225.

Shasta County—US 99—In and near the City of Redding at Ellis Street and at California Street. Grade and surface with plant-mixed surfacing on untreated rock base, 0.1 mile. Awarded to Fredrickson & Watson Const. Co., $15,444.44.

Sonoma County—SR 12—Between Rincon Creek and Kenwood, 5.5 miles. To be surfaced with plant-mixed surfacing. Awarded to Arthur B. Siri, Inc., $114,071.20.

Stanislaus County—US 99—Between Faith Road and Ceres Main Canal, 1.3 miles. Frontage road to be graded and paved with plant-mixed surfacing on untreated rock base. Awarded to Standard Materials, Inc., $66,928.65.

Tulare County—US 99—Between Kern county line and one-half mile north of Earlimart, 8 miles. To be graded and paved with Portland cement concrete and plant-mixed surfacing, and five bridges to be constructed. Awarded to Gordon H. Ball & San Ramon Valley Land Co., $1,791,255.30.

Tulare County—At the Visalia Airport interchange. Construct graded roadbeds, place Portland cement concrete pavement on cement treated subgrade, place plant-mixed surfacing on untreated rock base, apply seal coat and install highway lighting and illuminated sign systems, 3.2 miles. Awarded to Guy F. Atkinson, $610,151.45.

Tuolumne County—Between Sign Route 108 and Stanislaus county line, Keystone La Grande Road, 12.6 miles. To be surfaced with untreated rock base and penetration treatment applied thereto. Awarded to Clyde W. Wood & Sons, Inc., $106,080.

Ventura County—On Hueneme Road between Wood Road and Laguna Road, 2.2 miles. To be surfaced with plant-mixed surfacing on untreated rock base. Awarded to Fredrickson & Watson Const. Co., $88,444.

Yolo County—Across Cache Creek about five miles north of Woodland. Reinforced concrete girder bridge. Awarded to Lord & Bishop, Inc., $118,230.

Yuba County—US 99E—Between Olivenhurst and Marysville. Portion of a four-lane divided highway to be graded and surfaced with plant-mixed surfacing on cement treated base. Approach ramps to be constructed and four bridges to be constructed. Awarded to Granite Construction Co., $583,303.

ROAD BOND ISSUE

Continued from page 29 . . .

miles are still unchanged except for widening strips or new wearing surfaces. Approximately 18 of the 78 miles to be improved in the new $10,250,000 bond issue will be roadways constructed by the earlier bond program, and in several locations, the old pavement will serve as a partial base for the new. The fact that the new roads will cost about five and one-half times as much per mile as those constructed 30 years ago reflects the change in character of traffic and its consequent demand for wider lanes and shoulders, heavier pavements and bases, better alignments and sight distances, as well as the decrease in the value of the construction dollar.

The fact remains that the first bond issue road improvement program was and still is one of the best investments ever made by a county, and it is the goal of Road Commissioner Victor W. Sauer and his staff to make the present program give an equal return in value.

Fred P. Carner of the County Highway Department Construction Division staff was resident engineer, and O. E. Elliott was superintendent for the contractor on this latest FAS bond issue project.

FOLLOW THE LEADER

Drivers who can resist the passion to pass the car ahead find it a good policy to follow an intelligent pace setter. Within limits, they let the other fellow do their thinking. This practice requires staying far enough behind for safety and watching for signals.

GUARD RAILING

Continued from page 24 . . .

But for this guard rail auto would have struck tree

sult of a southbound vehicle continuing its curved path beyond a 2,400-foot radius curve and striking a tree on the west side of the highway where no railing was installed. The other fatality, during the after period, occurred when a southbound vehicle in the four-lane undivided portion of this highway crossed the northbound lanes, entered the adjacent railroad right of way and struck a tree behind the guard railing.

It is most gratifying that no fatalities have resulted from collision of vehicles with the guard railing. At locations where a vehicle would have struck a tree had not guard railing been in place, it is almost certain that the severity of the accident would have been much greater.

GRADE SEPARATIONS

Continued from page 6 . . .

financing of grade separations, their interests conflict. Responsible highway officials cannot properly approve use of highway funds to pay railroad obligations and the railroad officials cannot be expected to approve contributions to the construction of highways in excess of their legal obligation.

In the nature of the situation therefore, the necessity for referring apportionment of cost of a grade separation to a neutral commission is almost self-evident. The major problem confronting the highways with respect to construction of grade separations therefore, is to eliminate the delays incident to our present procedure. This can perhaps be accomplished by a law providing for the advancement of funds by the State for the initial cost of construction and then having the railroad's contribution adjudicated at a later date.

A CHAMPION

Continued from page 30 . . .

to previous years when they were inclined to be formal and stiff.

Started Lifting in High School

Tommy's interest in weight lifting began while he was still in high school. In 1948, the year of his graduation, and 1949, when he was attending Sacramento Junior College, he took part in several local weightlifting contests. In 1950 and 1951 he participated in the national weightlifting competitions, placing second on both occasions.

In 1951 he came to work for the Division of Highways, but left shortly afterward to serve two years with the Army, including overseas duty in Germany. He was granted a temporary leave of absence from the Army so that he could take part in the 1952 Olympic games in Finland. He returned to his job with the State after his discharge from the armed forces last year.

Safe Driving Day On December 15

Wednesday, December 15, 1954, has been proclaimed as "Safe Driving Day" by President Eisenhower, when individuals and organizations all over the Nation will join in a common effort to prevent death or injuries on our roads, streets and highways.

In California, the kick-off for the campaign among state employees took place at the November 29th meeting of the Governor's Council, when the head of each state agency received a set of gold-plated license frames bearing the inscription "Drive Safely." The presentation was made by Les Schwimley, a director of the Northern California Motor Car Dealers Association, and B. J. Audette, President of the Benmatt Organization, the manufacturer of the special frames.

Governor Goodwin J. Knight took a leading part in the Sacramento ceremony and, while witnessing the acceptance of these license holders by Director of Public Works Frank B. Durkee and Director of Finance John M. Peirce, he stated that "S-D Day" is an opportunity and challenge for all citizens in every walk of life. He urged that motorists and pedestrians, alike, accept personal responsibility for adherence to basic safety principles before, during and following the campaign so that the toll of traffic accidents could be materially reduced.

Durkee told the Governor that the Department of Public Works Safety Committee would immediately take action to see that the program was given the widest possible notice and support among department employees all over the State.

30,000,000 USED CARS IN WORK

Approximately 30,000,000 people, or 45 percent of all people employed in the United States today, make daily use of their cars in traveling to and from the job or on the job itself.

HIGHWAY EXPENDITURES

A total of more than 6 billion dollars will be spent on highway improvement and highway construction in the United States during 1954, predicts the National Automobile Club.

In Memoriam

HERBERT LEA MOSES

To the many friends of Herbert Lea Moses throughout the Division of Highways, we regretfully bring the annauncement of his death. Apparently in good health on Sunday, November 7, 1954, he was stricken suddenly.

Herbert Moses was born in New York City, July 12, 1907. Educated in Southern California, he joined the Division of Highways late in January, 1929, as a junior engineering aid assigned to a location survey party. He progressed through the grades in the highway engineering classification, and, becoming a registered civil engineer, was appointed to the associate grade late in 1952.

While Tex, as he was affectionately called, served mainly in the field, in construction as well as correlated activities, perhaps his most important assignment was his most recent. As head of a design section involved in a wide scope of projects, most of which required immediate completion, his talents in aggressive approach were invaluable.

For 25 years, Herb served the State in a responsible capacity. Brief interludes in his career in District IV have occurred. In 1932 he returned to Southern California for a six months' stay in District IX. During World War II, he was loaned for six months to the Housing Authority, and completing this assignment, joined the U. S. Navy. As a member of a construction battalion he served in the South Pacific, returning to Highways after a two and one-half year military leave of absence.

Beyond the limits of his profession, Herbert Lea Moses dug deeply into the field of human relations. In his high concept of our responsibilities toward each other, he was ever in search of a means to make this life a better one for all.

PEDESTRIANS KILLED AND INJURED

A total of 8,600 pedestrians were killed and another 165,000 were injured in traffic accidents in the United States during 1953.

PRAISE FOR TOMMY

MR. CHAS. E. WAITE
Assistant State Highway Engineer and

MR. FRANK M. REYNOLDS
Principal Highway Engineer

GENTLEMEN: We wish to express our sincere appreciation for allowing Tommy Kono a leave of absence from his duties in your department so he may have the opportunity to compete in the 1954 World's Weightlifting Championships here in Vienna, Austria.

Before and after the championships we receive many requests for exhibitions in various European countries. We take advantage of these opportunities since they serve as an effective means of spreading goodwill and help further cement European-American relations. In reality Tommy Kono is a goodwill ambassador as well as an athlete.

Tommy, this year, has been placed on the most vital position on our team. The Russians dominate the light classes and the Americans in the heavier ones. The outcome of the team championships, which we lost to the Russians for the first time last year, depends on the result of the light heavyweight class. Although Tommy will be the lightest man in this class he is the only American who can compete against the Russians on equal terms.

He sacrificed a sure first place in the middleweight class to lift in the light heavyweight division, to better our chance of regaining the team title for the United States.

We are proud to have Tommy as a member of our team. His conduct off the weightlifting platform as well as in competition reflects great credit to our Country.

Thank you again for your consideration.

Sincerely yours,

CLARENCE H. JOHNSON
President, Weightlifting Comm.
A. A. U. of U. S., Vice Pres.
Int'l W L Federation

BOB HOFFMAN
Vice Pres., Weightlifting Comm.
A. A. U. of U. S., Coach
American Olympic Team

GOODWIN J. KNIGHT
Governor of California

FRANK B. DURKEE . . Director of Public Works

CALIFORNIA HIGHWAY COMMISSION

FRANK B. DURKEE, Chairman

H. STEPHEN CHASE . . . . . . Sacramento
JAMES A. GUTHRIE . . . . San Bernardino
CHARLES T. LEIGH . . . . . . San Diego
ROBERT E. McCLURE . . . . Santa Monica
F. WALTER SANDELIN . . . . Ukiah
CHESTER H. WARLOW, Vice Chairman . Fresno
R. C. KENNEDY, Secretary . . . . . Sacramento
RUSSELL S. MUNRO, Deputy Director of Public Works

DIVISION OF HIGHWAYS

GEO. T. McCOY
State Highway Engineer, Chief of Division

R. M. GILLIS . . . Deputy State Highway Engineer
CHAS. E. WAITE . . Assistant State Highway Engineer
EARL WITHYCOMBE . Assistant State Highway Engineer
F. W. PANHORST . . Assistant State Highway Engineer
J. W. VICKREY . . Assistant State Highway Engineer
R. H. WILSON . . . Assistant State Highway Engineer
F. N. HVEEM . . . Materials and Research Engineer
GEORGE F. HELLESOE . . . . Maintenance Engineer
J. C. YOUNG . . . . Engineer of Design
G. M. WEBB . . . . Traffic Engineer
MILTON HARRIS . . . . . . Construction Engineer
H. B. LA FORGE . Engineer of Federal Secondary Roads
C. E. BOVEY . Engineer of City and Cooperative Projects
EARL E. SORENSON . . . . . Equipment Engineer
H. C. McCARTY . . . . Office Engineer
J. C. WOMACK . . . . Planning Engineer
J. P. MURPHY . . . . Principal Highway Engineer
F. M. REYNOLDS . . . . Principal Highway Engineer
E. J. SALDINE . . . . Principal Highway Engineer
A. L. ELLIOTT . . . . Bridge Engineer—Planning
I. O. JAHLSTROM . . . Bridge Engineer—Operations
J. E. McMAHON . . Bridge Engineer—Southern Area
STEWART MITCHELL . Bridge Engineer—Special Studies
E. R. HIGGINS . . . . Comptroller

Right of Way Department

FRANK C. BALFOUR . . . . Chief Right of Way Agent
E. F. WAGNER . . Deputy Chief Right of Way Agent
GEORGE S. PINGRY . . . . Assistant Chief
R. S. J. PIANEZZI . . . . Assistant Chief
E. M. MacDONALD . . . . Assistant Chief

District IV

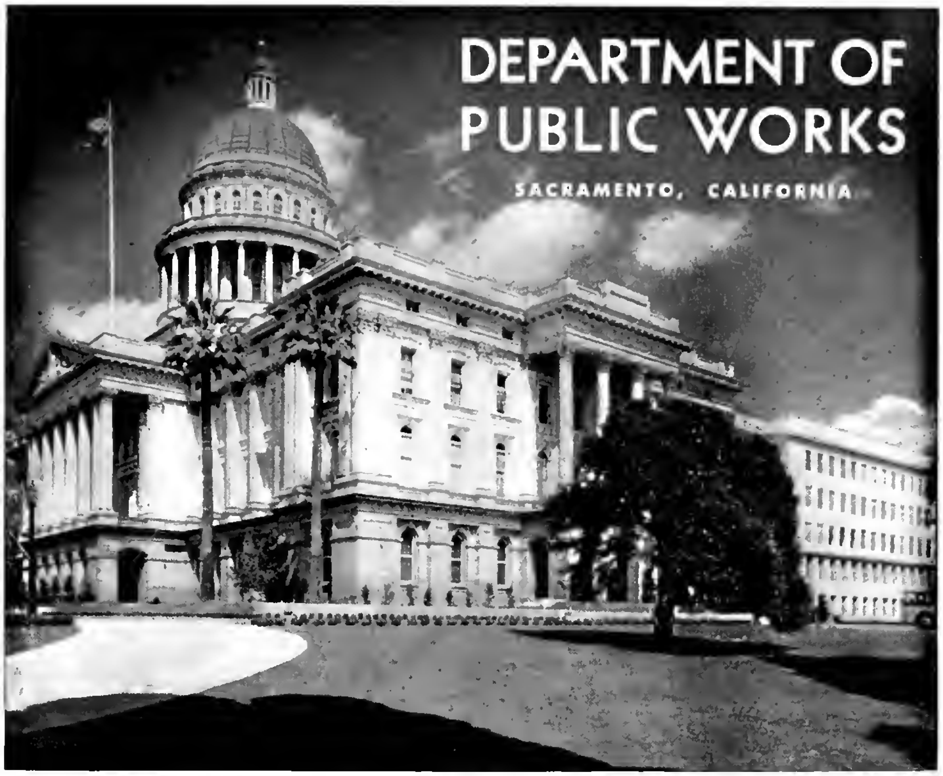
B. W. BOOKER . . Assistant State Highway Engineer

District VII

P. O. HARDING . . Assistant State Highway Engineer

District Engineers

ALAN S. HART . . . . District I, Eureka
J. W. TRASK . . . . District II, Redding
A. M. NASH . . . . District III, Marysville
J. P. SINCLAIR . . . . . District IV, San Francisco
L. A. WEYMOUTH . . . . District IV, San Francisco
E. J. L. PETERSON . . . District V, San Luis Obispo
E. T. SCOTT . . . . District VI, Fresno
W. L. FAHEY . . . . . . District VII, Los Angeles
E. T. TELFORD . . . . . District VII, Los Angeles
C. V. KANE . . . . . District VIII, San Bernardino
F. E. BAXTER . . . . District IX, Bishop
JOHN G. MEYER . . . . District X, Stockton
E. E. WALLACE . . . . District XI, San Diego
HOWARD C. WOOD . . . . Bridge Engineer
State-owned Toll Bridges



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Oct. 1953

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P. O. Box 1499
Sacramento, California

Excellent Record of School Patrols

State Prepares Free Booklet

By GEORGE M. WEBB, Traffic Engineer, and J. J. SPOTTISWOOD, Assistant Traffic Engineer

A recent ruling by Attorney General Edmund G. Brown regarding responsibility for the protection of children crossing streets on their way to and from school has attracted considerable interest throughout the State, particularly among school authorities and law enforcement agencies.

The opinion was rendered in response to the request of District Attorney W. O. Weissich of Marin County, who asked specifically whether it was the duty of the City of San Anselmo or the San Anselmo School District to provide policemen or guards at school sites.

Attorney General's Opinion

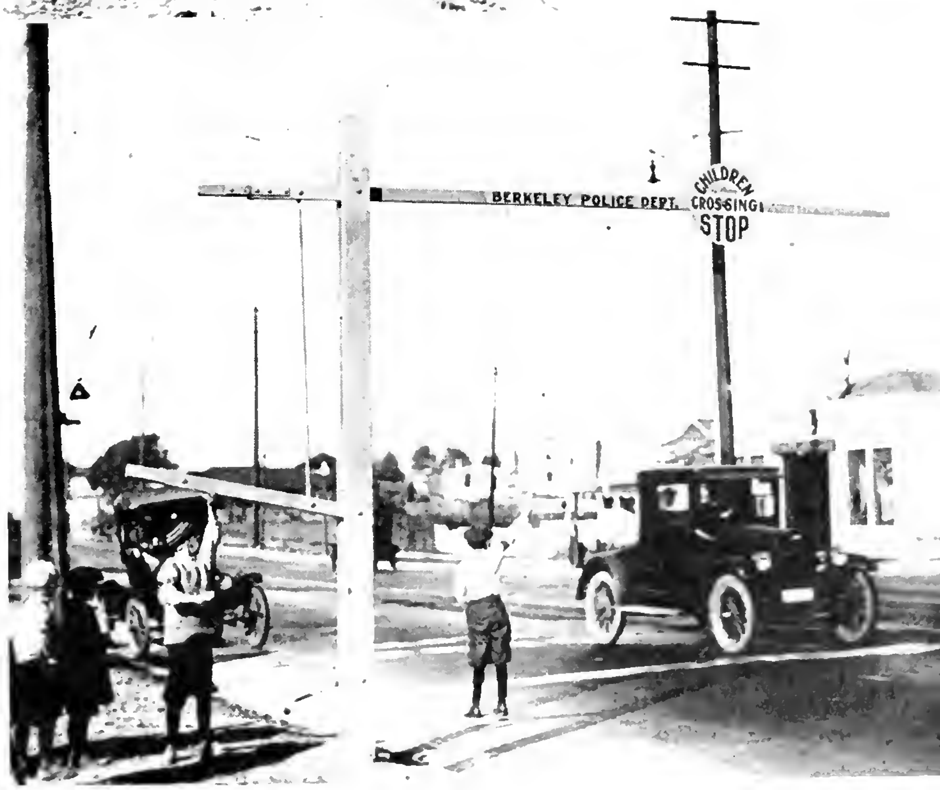
The Attorney General's opinion, dated October 19, 1954, is summarized as follows:

"1. The City of San Anselmo has a duty to provide protection to school children crossing streets as they go to and return from school, but whether such protection is required at the school depends upon the conditions existing at each particular site.

"2. The San Anselmo School District does not have a duty to control traffic so as to provide protection for school children crossing streets as they go to and return from school, but at the school site

EDITOR'S NOTE: The Division of Highways has prepared a handy illustrated booklet on signs, signals and devices used for school crossing protection on state highways.

Persons interested in obtaining a copy of the booklet should address their request to Traffic Engineer, Division of Highways, Public Works Building, P. O. Box 1499, Sacramento 7, California; or to this magazine.



First school safety patrol in Berkeley in 1923. These photos taken at intersection of San Pablo Ave. and Virginia St. See photo, lower left, on page 2 taken at same intersection in December, 1954.

UPPER LEFT At Ashby and King Sts. in Berkeley, Lincoln School patrol members and students wait for the patrol leader's signal. UPPER RIGHT—All clear, the patrol leader blows his whistle, the sign operators take their positions, and the children are allowed to proceed. In Berkeley, the crossing sign operators stand at the edge of the parking lane for better visibility LOWER LEFT On busy arterials in Berkeley, traffic is stopped simultaneously on all legs of an intersection. The stopped vehicles themselves provide a protective barrier. This is San Pablo Ave. and Virginia St., location of the first Berkeley school safety patrol on January 16, 1923 LOWER RIGHT Weekly drill is regular procedure for Berkeley school safety patrols. Mr. Herman Nyland is the teacher-sponsor at Columbus School (pictured).

and the streets immediately adjacent thereto conditions may warrant some form of supervision of the students depending on the risks involved."

The problem of protecting the school child is older than the automobile itself, but its magnitude has grown through the years with increase in the State's population and motor vehicle registration.

Problem One of Scope

There is not now and never has been any doubt that the protection of the children is a community problem which must be shared by parents, community agencies, police, and schools. The question rather is one of scope. Some California authorities have believed that the responsibility of the school is and should be limited to the education of the children in safe and proper traffic behavior, and that their physical protection on streets and highways off the school grounds is the responsibility of the law enforcement agency.

Other authorities, realizing the practical limitations of actual police protection, have for years exercised some form of supervision of the students on the streets immediately adjacent to the schools.

Patrols Successful

One of the most successful methods for elementary and intermediate schools has been the use, in cooperation with the police departments in cities and with the California Highway Patrol in rural areas, of school safety patrols. These patrols are made up of boys, and sometimes girls, in and above the fifth grade.

California's law authorizing school safety patrols in the public schools was enacted in 1947, but the idea is much older. Nationally, the earliest experiments with school safety patrols go back some 35 years. In this State the first cities to organize patrols were Berkeley and San Francisco. Both did so in 1923 through the joint efforts of the city school departments, the police departments, and the California State Automobile Association. The American Automobile Association was one of the earliest sponsors of the school safety patrol idea, and through the years has continued to be one of its most active and enthusiastic supporters.

It doesn't rain very often in San Diego, but the school safety patrol is well prepared

Authorized by Law

Legal authority for school safety patrols in California is contained in the State Education Code, which authorizes any school district to establish and maintain patrols, subject to rules and regulations adopted by the State Board of Education.

Police departments in cities, and the California Highway Patrol in unincorporated areas, are authorized by the law to cooperate in the establishment of school safety patrols upon request of the governing board of any school district. The law is specific that the patrols are for the purpose of assisting pupils in safely crossing streets and highways adjacent to schools, and that patrol members are authorized and required to give signals and directions only for that purpose. Attorney General Brown says that the school safety patrol is not to be deemed protection in lieu of actual police protection, but rather supplementary, and that police officers should be present when conditions warrant.

Operating Procedure

Rules and Regulations of the State Board of Education relating to School Safety Patrols are set forth in the California Administrative Code. They cover in detail the establishment, general duties, and operating procedure of the patrols; and they specify the type of crossing sign, uniforms, and insignia.

Briefly, the prescribed operating procedure for school safety patrols is as follows:

(a) At crossing controlled by a police officer or crossing guard, the patrol members direct the crossing of the students in conformity with the signal of the police officer or guard.

(b) At crossing controlled by automatic traffic signals, the patrol members hold the students off the street or roadway until the signal allows them to cross safely, and require latecomers to wait for the next green light.

(c) At crossings with neither automatic nor pedestrian signals, the patrol members are so posted that they are clearly visible to approaching traffic. They stay out of the roadway unless their view is obstructed by parked cars, in which case they are posted no farther into the roadway than the outer edge of the

San Diego doubles the number of patrol crossing signs on more heavily traveled streets for greater safety. On four-lane streets with center curbed islands, one of th sign holders stands in the island for better visibility of drivers in the inside lane.

parked cars. They do not permit students to enter the roadway until it appears safe, and then direct them to cross in groups. Not until the children are safely across do the patrol members change the crossing signs to permit traffic to proceed.

(d) At crossings where there are pedestrian-operated signals, patrol members operate the signals. They are careful to activate the signals when there is a break in the traffic stream, and they control the students as in the case of automatic signals.

Patrol members also see that pedestrian overcrossings and undercrossings are used, when there are such facilities, and they supervise the loading of buses and streetcars.

Standard Uniform

The basic standard uniform is a federal yellow overseas cap to which optional colored piping may be added. It must be worn by patrol members at all times while on duty. White Sam Browne belts and red jackets or sweaters are optional; some school districts provide the belt, some the jacket, some both. The City of San Diego also requires white pants and white shirts. Insignia or special badges identifying the organization are also permitted by the code.

Rainy-day uniforms consist of federal yellow raincoats and rainhats, with or without the Sam Browne belt. Some cities also provide rubber boots.

Most schools furnish the rain clothes, but many provide only the yellow cap for regular wear. The full uniform, however, appears to have several advantages. It is much more discernible to the motorists, and therefore safer; it inspires a higher morale among the patrols; and, like grownups, the children seem to react more readily to the authority of a badge and uniform.

Service Voluntary

The official school safety patr crossing sign is a red disc 18 inche in diameter with the words "Sto School Crossing" in white letters. Th sign is fastened to a six-foot pole a such an angle that the lettering is hori zontal when the sign is extended diag onally toward the street.

Service on the school safety patr is voluntary, but there is never dearth of applicants. Appointment t the patrol is considered to be a privi lege by the great majority of student Most small boys look forward to th day when they will be big enough t serve, and older boys are honored t be chosen for the responsibility. Pa rental objection is rare; the usua reaction is pride that their boy ha been found to have the qualities neces sary for such a responsibility.

Members of the safety patrols ar selected by the school principals upo the recommendation of the teacher with, of course, the consent of the pu pil and his parents or guardians. Squa leaders and other officers are ap pointed by the supervising police officer from the upper-class veterans, guided by the recommendation of the teachers and, in some cases, by vote of the patrol members themselves.

Police Officers Help

The key to a successful school safety patrol is the police officer or patrolmen assigned to supervision of the program. In unincorporated areas California Highway Patrol personnel assist in this service as part of their regularly assigned duties. In some of the larger cities details of police officers are assigned full time. Without exception the officers interviewed in the preparation of this article were enthusiastic about their assignment, and were wholehearted believers in the value of the school safety patrol idea. Their attitude and efforts are directly reflected in the behavior and performance of the boys and girls under their charge.

Most California cities allow school safety patrols to operate alone only on streets of light to moderate traffic, limiting their activities on heavily traveled streets to assisting police or adult guards. Berkeley is a notable exception. There, on busy streets, without the aid of policemen or adult guards, the patrols stop traffic simultaneously on all legs of an intersection before permitting the children to cross, thus making the vehicles themselves provide a protective shield. One such location at San Pablo Avenue and Virginia Street is illustrated.

San Francisco System

San Francisco does not use the prescribed stop sign in connection with its patrols, but does require the presence of a regular uniformed policeman where the volume of traffic is such that the children cannot cross in safety without having the traffic controlled. At these locations the school safety patrols assist the police officer by monitoring the children on the sidewalks. At intersections with light to moderate traffic, the patrols do not stop the vehicles but hold back the children on the sidewalk until the street is clear.

On rural roads and highways, if there is the slightest doubt as to safety, the California Highway Patrol does not encourage the use of school safety patrols. However, the patrols have been operating successfully on some heavily traveled highways. One example is at Davis School on US Highway 50-99 a few miles north of Stockton (illustrated). At this location, a four-lane divided highway, there are yellow flashing lights on standard school signs on both sides of each roadway 500 feet in advance of the school crossing. The lights are put in operation only when children are entering or leaving the school grounds.

With traffic safety stopped in both directions, a Washington School patrol squad leader in San Diego is about to release the children

UPPER—Children are held in the dividing strip at Davis School on US 50-99 until the safety patrol squad leader on the second roadway determines it is safe to cross. LOWER—On US 50-99 north of Stockton, a divided highway, Davis School safety patrols operate independently of each other, one on either roadway.

Squads of Three

Two three-member squads operate independently of each other at this location, one on the northbound and the other on the southbound roadway. They conduct the children across the highway in two steps. A boy with a stop sign is stationed on each side of both roadways 50 feet in advance of the crosswalk, and they operate their signs at the whistled commands of the squad leaders. The squad leaders' positions are at the crosswalk on the side of the approaching children, and they do not permit the children to enter the roadways until it is safe to do so.

And what about the accident record of school safety patrols? San Francisco, one of the two California cities with the longest record, reports not a single fatality at a patrolled intersection in the 30 years they have been operating. Berkeley, the other veteran city, reports not only no fatalities, but only five accidents in 30 years at intersections controlled by the school safety patrol. All of the five accidents recorded were due to drivers' negligence, and not the fault of the patrol. Other cities and counties claim similarly excellent results.

More Uniform Procedure

Successful as the school safety patrol system has proved, some authorities believe that it could be improved by more uniform procedure. Some cities, for instance, do not post patrols at intersections where there are traffic signals, or they remove the patrol after signals are installed.

A traffic signal does not mean that a school patrol or a crossing guard is not needed. Traffic authorities know that there is a general tendency to place too much reliance on the protection of a traffic light and too much faith that the motorist will never miss or violate the red signal. This belief is especially prevalent among nondrivers, which of course include the elementary and intermediate school child. Also, there is a particular hazard for the small child to start across the intersection too late to reach the other

. . . Continued on page 58

UPPER LEFT—At Broadway and Franklin St. in San Francisco, school safety patrol members are holding the children for the traffic signal, which has just flashed green. UPPER RIGHT—The same intersection a few seconds later. LOWER LEFT—Girl patrol members are no less efficient and effective than boys. This is at Union and Franklin Sts. in San Francisco. LOWER RIGHT—The school safety patrol at Saint Brigid's parochial school in San Francisco prepare to march to their posts.

Truck Loads

Division of Highways Reports to Legislature on Effect of Weight Limitations on Axles

Senate Resolution No. 28

Relative to Axle Weight Limitations

WHEREAS, This house has before it from time to time legislation with respect to the maximum weight limitations on each axle of commercial vehicles; and

WHEREAS, This house needs to be advised with respect to the effect of such limitations and any change therein on state highway construction and maintenance; now, therefore, be it

Resolved by the Senate of the State of California, That the Director of Public Works is requested to report to the Senate of the State of California at its January, 1955, Session with respect to the effect of maximum weight limitations on single axles of commercial vehicles and the effect thereof on highway construction and maintenance; and be it further

Resolved, That the Secretary of the Senate transmit a copy of this resolution to the Director of Public Works.

The following report by the Division of Highways is in compliance with this resolution.

I. CONCLUSIONS

The following conclusions are the essence of this report. They represent, to the best of the ability of those charged with the construction and maintenance of state highways in California, the effect of axle loads and vehicle loads on the State Highway System.

(1) In the postwar period of 1947 to 1953, the average gross weight of commercial vehicles (including loads) on state highways has increased 18 percent and the percentage of axles carrying the heavier loads between 12,000 and 18,000 pounds has increased from 14 percent to 25 percent. In the same period, the average volume of commercial traffic has increased 40 percent. These increases in axle loading within the present law are rendering obsolete the thousands of miles of older highway not designed for such heavy loading.

> This report has been submitted by the Division of Highways to the Legislature in accordance with California State Senate Resolution No. 28, 1954 First Extraordinary Session.

(2) At the present time, the annual cost of reinforcement and maintenance of the travel lanes on state highways has risen to approximately $24,000,000. Any increase in axle loading would substantially increase this annual cost.

Construction Cost Increase

(3) If axle loadings were increased 25 percent, strengthening of the pavement would be required on 8,260 miles of older highways. The total cost of this strengthening is estimated to be $96,000,000.

(4) It is estimated that a 25 percent increase in present axle loading would increase new road construction cost by 10 percent. To construct annually the mileage of road work let to contract in the Fiscal Year 1953-54, the increase in cost would amount to approximately $14,000,000 per year.

(5) Without considering the increased future cost of maintenance, it is estimated that the increase in new road construction cost and the strengthening of the older roads would require over $298,000,000 within the deficiency period ending in 1967 if a 25 percent increase in axle loads should be enacted into law.

II. EFFECTS OF PRESENT RESTRICTIONS ON AXLE LOADS ON EXISTING STATE HIGHWAYS

Like any other engineering structure, the life of a road pavement structure and its cost of operation depend largely upon the weight of loads that it must carry and upon the number of times that these loads must be carried. The vast increases in the number of commercial vehicles on the State Highway System, together with the increases in weights within the present statutory limitations, have placed a great strain on the existing pavement structures.

Past reports on highway needs and highway deficiencies have said much about traffic gains and increases in truck weights during the war years of 1942 to 1945. What is transpiring in the current postwar period? Consider *Plate A*, which depicts graphically the average daily volumes of commercial traffic on state highways for the period of 1947 to 1953, inclusive. For every 1,000 commercial vehicles using the highways in 1947, over 1,400 are using the highways today.

Weights Increasing

Weights, too, are increasing. The State Division of Highways has carried on a truck weighing program over a period of years, beginning in 1936. Comparison of 1936 and 1944 data indicates an increase in the average weight of trucks and truck combinations from 11,556 to 19,281 pounds. It is interesting to note that from 1944 to 1953, during the postwar period, the average weight has increased to 25,114 pounds. *Plate B* presents the weight trends graphically.

Of greater significance than gross weights of vehicles is the weight per wheel or per axle of each vehicle, since it is these loadings or pressure points on the road surfacing that affect its service life. Each year, weighing stations are operated at key locations on the State Highway System and at these locations the individual axle loadings of trucks are measured.

Upward Trends

Examination of weight data indicates substantial upward trends in the weights being carried on each axle of commercial vehicles. These upward trends are of utmost importance. In

INDEX OF AVERAGE DAILY TRUCK TRAFFIC ON RURAL STATE HIGHWAYS

1947 AVERAGE = 100

(Pickups not included as trucks)

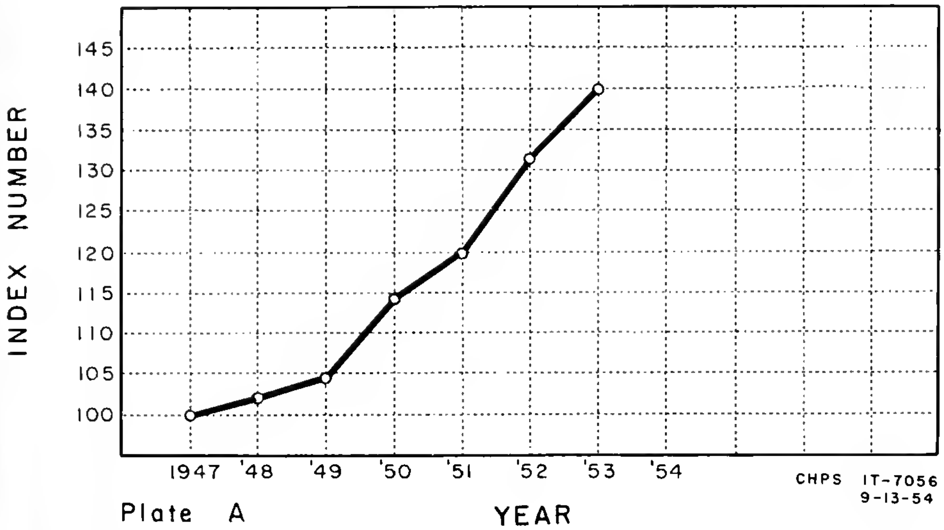


Plate A

1947, after the war, only 32 percent of all truck axles were loaded to more than 8,000 pounds. In 1953, over 44 percent of truck axles were loaded to more than 8,000 pounds. Eighteen percent of all axles were loaded to weights between 8,000 pounds and 12,000 pounds in 1947. This weight group had increased to 19 percent by 1953. The greatest damage to road pavement is caused by the heavier loads. These heavier axle loads, between 12,000 pounds and the legal maximum of 18,000 pounds, had increased from 14 percent in 1947 to 25 percent in 1953.

Summarizing

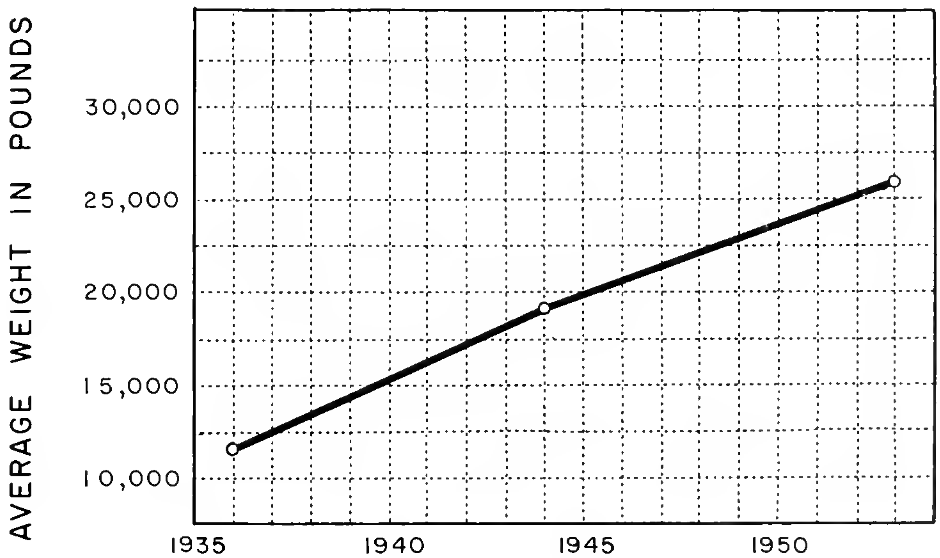
In summarizing the effects of increases in commercial vehicles and the increases in weights of commercial vehicles, the following points may be offered:

1. In numbers, commercial vehicles have increased by 40 percent in the six years from 1947 to 1953.
2. The average weight of all commercial vehicles has increased over 18 percent in the same period.
3. Because of the increase in the weight per axle of commercial vehicles, the effect on the service life of pavements is far greater than might be expected from the increases in gross vehicle weights and numbers.
4. The greater weights and numbers of commercial vehicles mean greater costs of road repair, greater costs of road construction, and shorter service life of existing road pavements. These greater costs are being caused by present traffic conforming to present law.

III. WHAT WOULD BE EFFECT OF INCREASE IN PRESENT STATUTORY LOAD LIMITS?

The approach to the problems of what would occur if load limits were increased need not be based on the hypothetical. The exigencies of the war effort and the call for rapid development of the military plant led to the hauling of many excessively heavy or illegal loads over the State Highway System. In many instances serious damage was inflicted to pavements that otherwise would have served satisfactorily for many years. This damage by war-caused traffic was recognized by the Federal Gov-

AVERAGE WEIGHT OF TRUCKS AND TRUCK COMBINATIONS ON RURAL STATE HIGHWAYS



1936	=	11,556	Lbs.
1944	=	19,281	Lbs.
1953	=	25,114	Lbs.

Source Weight CHPS Data Sheets

Plate B

PAVEMENT ON STATE ROUTE 5 DAMAGED BY OVERWEIGHT LOADS

PLATE C

ernment and, as a result, $1,787,359.95 was paid to California by the Federal Government toward the cost of repair.

Plates C and D present evidence of some of the failures that occurred when these heavy loads were applied. Note the damaged condition of the lane that carried the loaded vehicles as compared to the lane that carried the returning empty vehicles.

The pictures presented represent pavement designs that are substantial and which would carry present legal loadings on main line highways for many years. There are many miles of such pavements in service now. With an increase in load limits such road failures could be expected to be general.

Another realistic approach to the effect of heavier vehicle loading is the test tracks. These test tracks yield invaluable data to the highway engineer when, under controlled conditions, direct comparisons of the effect of various axle loads may be made. One of the most notable of these tests was Road Test One-Md., conducted in 1950 in Charles County, Maryland. This test was conducted under the auspices of the highway departments of 11 states, the District of Columbia, and the U. S. Bureau of Public Roads. The actual testing was under the direction of the Highway Research Board, a subdivision of the National Academy of Sciences.

California Law

California law now restricts the loading on single axles to 18,000 pounds and on closely spaced tandem axles to 32,000 pounds. Many miles of pavement in California are similar to the pavement subjected to the Maryland road test. With these thoughts in mind, attention is drawn to the following conclusions from that test:

(a) The 44,800-pound tandem axle loads caused approximately 11 times as much cracking (lineal feet) as the 32,000 pound tandem axle loads. This relationship held true over a period of almost four months, that is from 20,000 to 92,000 truck passes in each lane.

(b) The 22,400-pound single axle loads caused approximately six times as much cracking (lineal feet) as the 18,000 pound single axle loads. This relationship held true over a period of almost five months, that is from 35,000 to 238,000 truck passes in each lane.

(c) After 84,000 truck passes, 80 percent of the joints in the section carrying 44,800-pound tandem axle loads were depressed, whereas, with the same number of truck passes, only 10 percent of the joints in the section carrying 32,000-pound tandem axle loads were depressed. (Depressed joints are defined as those joints at which a marked localized settlement of the pavement has occurred, accompanied by cracking of the pavement in the vicinity of the joint.)

(d) After 137,000 truck passes, 22 percent of the joints in the section carrying 22,400-pound single axle loads were depressed, whereas, with the same number of truck passes, only 2 percent of the joints in the section carrying 18,000-pound single axle loads were depressed.

Maryland Experience

The facts developed in Maryland confirm experiences with earlier test tracks in California at Stockton and Brighton. Experiences with California State Highways bear out the fact that repetitions of heavier axle loads lead to rapid destruction of pavements that are not designed for these heavier loads.

Of the 13,769 miles of constructed road in the California Highway System, 5,149 miles have been constructed or reconstructed to modern standards within the last few years. The remaining 8,620 miles of older roads were constructed to lighter structural standards. If heavier axle load limits were adopted, it would be necessary to strengthen these older pavements as rapidly as possible to prevent complete destruction of the riding surface.

The need for this strengthening would vary in proportion to the increases in axle weights on each individual road section and the noticeable effect of the loads on the particular pavement. It is estimated that the cost of a minimum strengthening of the riding surface on these older highways would total $96,000,000.

IV. WHAT WOULD IT COST TO DESIGN FOR HEAVIER LOADS?

It is well within the ability of the Highway Engineer to design and construct roads capable of withstanding loads of any reasonable magnitude. The controlling factor is cost.

In some states, a 25 percent greater loading is permitted on single axles than that permitted under California law. In those states, for "thruway" or "turnpike" construction, which is the counterpart of California's freeways, a pavement design for the heavier loading costs about 30 percent more per square yard than the cost of road pavements in California. This difference is due to the greater structural strength required to support the loads.

What effect does this have on the total cost of road construction? On the average, the cost of the structural elements in the upper 24 inches of the roadbed amounts to about 32 percent of the total cost of road construction. If loadings are increased 25 percent, the cost of these structural elements will be increased, and present over-all construction costs will be increased about 10 percent. Where funds today will build 100 miles of new high standard road, tomorrow, if load limits were increased, these same funds would build only 91 miles of road.

PAVEMENT ON STATE ROUTE 60 DAMAGED BY OVERWEIGHT LOADS


Pavement failure between Hueneme Rd and Oxnard


Pavement failure between Hueneme Rd and Oxnard

PLATE D

V. HOW MUCH WOULD MAINTENANCE COSTS INCREASE IF HEAVIER AXLE LOADS WERE LEGALIZED?

Like the service life of a pavement, the cost of maintaining or operating a road pavement depends largely upon the weights of loads that it must carry and the number of times that these loads must be carried.

On a lightly traveled road or on a road where heavy loads are infrequent, the operation cost is low. On a heavily traveled road where both the number and weights of loads are high, the operation cost is high. On a road where the weights and number of loads are beyond that for which the pavement was designed, total failure may occur and the costs of repair may approach new construction costs.

Consider the examples of road life on *Plate E*. Note that similar four-inch pavements were constructed in Tulare County on Route 4-A (U. S. Route 99) in 1918, and on Route 131-B two years later in 1920. Route 4-A is one of the principal north-south highways and carried an average of 1,840 commercial vehicles per day in 1953. On the other hand, Route 131-B is a local service road with an average of only 140 commercial vehicles in 1953.

Note the frequency of repair work necessary on Route 4-A. Also note that the original pavement on Route 131-B is still serving without repair. The annual per mile cost of maintenance of the road surfacing or traveled way amounts to approximately \$137 for Route 131-B and \$360 for Route 4-A. This is in addition to the major repair work shown on *Plate E*, which was done with construction funds. The principal difference between these two roads from the beginning insofar as service life is concerned has been in the weight and number of vehicles.

Would Mean Road Failure

These two roads are not isolated examples. In varying degree they represent the bulk of the 14,000 miles of State Highway System today. With little doubt, if Route 4-A traffic, conforming to all present legal load restrictions, were diverted onto the old road pavement on Route 131-B, a complete failure of the road pavement would occur almost immediately. Referring to the effect of loading over the present legal limits, as shown on *Plates C and D*, also leaves little doubt that if those now illegal loadings were legalized, rapid failures in the massive pavement section on Route 4-A could be expected.

Returning to *Plate E*, it must be restated that the several increments of resurfacing required on the Route 4-A section were financed by construction funds since such repair is beyond the scope of routine maintenance. In the year 1953, about 11 percent of funds available to the Division of Highways for major improvements, minor improvements, and betterments were required for this type of construction repair. In money, this amounted to approximately \$15,000,000 in 1953. This does not include the annual cost of routine maintenance. For perspective, it may be observed that in addition to the cost of construction repair, approximately \$8,800,000 is expended now each year for routine maintenance of the traveled way or pavement lanes. As weights and numbers of heavy vehicles or axle loads increase, these costs may be expected to increase correspondingly.

STRUCTURAL ELEMENTS OF ROAD PAVEMENTS ON STATE ROUTES 4-A AND 131-B IN TULARE COUNTY

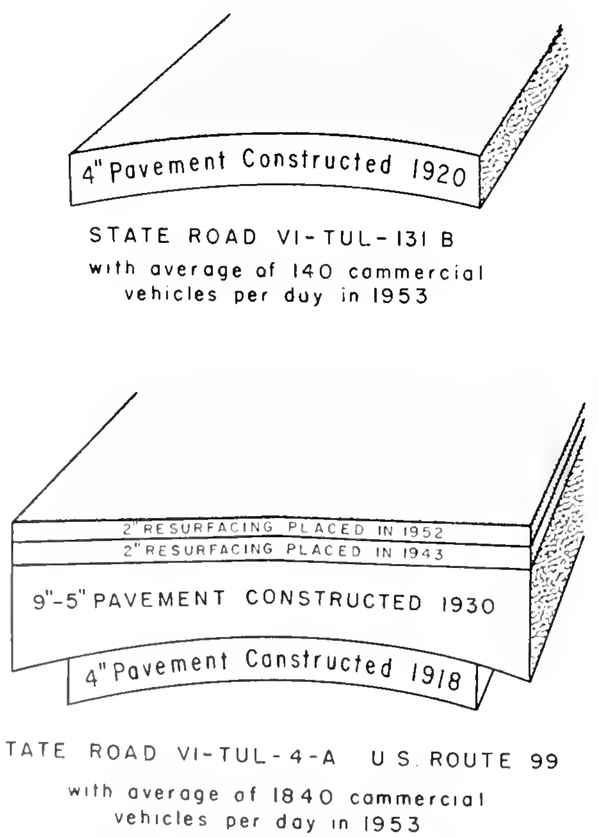


Plate E

Maintenance Costs

In estimating the increase in maintenance and construction repair cost, if load limits are increased, it could be said that traveled way maintenance cost plus construction repair of the traveled way have increased to approximately $24,000,000 annually with the increases in loadings and traffic that have occurred within present legal limitations, and this increase is continuing.

This $24,000,000 in 1953 is the cost of wear and tear on the pavement. It indicates that now the cost of operation of the pavement alone on state highways has risen to almost $2,000 per mile per year. It indicates that more and more of the construction dollar is being required to repair and keep in service the existing road system. It indicates that less and less of the construction dollar is going into high standard freeway construction.

How much would maintenance and operation cost be increased if load limits were increased? This cannot be precisely estimated. In a previous section, it was shown that in the Maryland test a 25 percent increase from 18,000 pounds per axle to 22,400 pounds per axle increased the rate of cracking in the pavement by 600 percent. Also recall that at present approximately $9,000,000 are being expended annually for routine maintenance of the traveled lanes and approximately $15,000,000 are being expended from construction funds for construction repair of the traveled lanes. Most certainly an increase in load limits would increase these costs substantially.

VI. WHAT EFFECT WOULD INCREASE IN PRESENT LOAD LIMITS HAVE ON BRIDGES?

Like a road pavement, the life of a bridge depends largely upon the weights of loads that it must carry and the number of times these loads must be carried. Application of loadings beyond the supporting ability of either a road pavement or a bridge will produce an overstress in the structure and damage will result. In a road pavement, the visual evidence of damage may amount to cracking of the surfacing. In a bridge, it may result in total collapse such as shown in *Plate F*.

A road pavement failure may result in a rough distorted roadbed where travel speed must be reduced to a crawl while repair is undertaken. A bridge failure may result in road closure for long periods of time and involve costs amounting to bridge replacement. For these reasons, the design of bridges must include a greater factor of safety than that required for a road pavement. For these same reasons, great caution must be used in permitting vehicle loadings that overstress a bridge.

In the study of any proposal to increase axle weights or vehicle loading, the primary consideration must be the probable effect on the bridges now in use on state highways. At present, the design of bridges is based on the H 20-S16 * loading. This loading conforms to the recommendation of the American Association of State Highway Officials, and is at present the national standard for bridge design. Of the 4,875 existing bridges on state highways, about 975, or 20 percent, have been constructed to this modern standard. It is believed that moderate

* H 20-S16 designation represents a truck and trailer having a gross weight of 36 tons, with an 8,000-pound loading on the front axle and with 32,000-pound loadings on each of two pair of rear tandem axles.

. . . Continued on page 34

PLATE F

District VII Freeways

Developments in the Los Angeles Area

By PAUL O. HARDING, Assistant State Highway Engineer

In three previous issues spaced about one year apart of *California Highways and Public Works*, I have discussed the role of the State Division of Highways in the development of freeways for the Los Angeles area. In these prior writeups details were given concerning the historical background, the setup for financing state highway projects and the splendid cooperation on the part of all governmental units, civic organizations and public-minded citizens that has prevailed so that plans on the boards could be converted into usable freeways. This present story is confined largely to the important developments that occurred during the year 1954 in the furtherance of freeways in the District VII area with a forecast of what can be anticipated for the year 1955.

Freeway Mileage

The year 1954 was one of considerable accomplishment from the standpoint of getting important units of the District VII freeways completed, putting additional freeway mileage under active construction, and acquiring freeway rights of way for future construction. In the Los Angeles metropolitan area during 1954 we completed an additional 20 miles of full freeway. This brings the length of completed full freeways in the Los Angeles area to a total of 66 miles.

The accompanying map indicates the extent of accomplishment and shows how the main freeway trunk lines are radiating out from the Los Angeles downtown area to serve outlying communities, and are now coming much closer to making connections with completed expressways and multiple-lane highways in those less built-up and undeveloped areas of Los Angeles, Ventura and Orange Counties, which three counties comprise District VII of the State Division of Highways.

The Engineering Department of the Automobile Club of Southern California, which is headed by Ernest East, Chief Engineer, and Hal Holley, Assistant Chief Engineer, in a report released August, 1954, entitled, "An Appraisal of Freeways vs. Surface Streets in the Los Angeles Metropolitan Area," describes practical test runs made by this organization on freeways and on surface streets. From data accumulated on these test runs it has been determined that the average cost of automobile operation on the freeways is 4.021 cents per mile whereas the average cost on surface streets is 8.215 cents per mile.

Economic Justification

In the Automobile Club report on page 12 is developed an economic justification for the Los Angeles Metropolitan Freeways, which appears in some detail in the article "Safer Highways," elsewhere in this issue of *California Highways and Public Works*. The Automobile Club report states:

"At the indicated saving of 4.194 cents per vehicle mile, the annual saving to freeway users amounts to nearly $50,000,000, an amount equal to more than one-third the total cost of the completed freeways. If it were possible, by a wave of a magic wand, to superimpose the completed 600-mile freeway system onto the street and road network of the coastal plain of Los Angeles County, we could conservatively expect the 600-mile freeway system to carry with a minimum of congestion and with maximum safety a weighted average daily traffic of some 30,000 vehicles. These vehicles would generate about 6.6 billion vehicle miles of the total of 21.6 billion vehicle miles now traveled annually in Los Angeles County, and the saving to drivers using the completed system would exceed $275,000,000 per year. The present 45-mile freeway system now in use is actually saving motorists $50,000,000. Thus, the drivers of Los Angeles County are paying $225,000,000 per year because our freeway system is not complete."

Direct Benefits

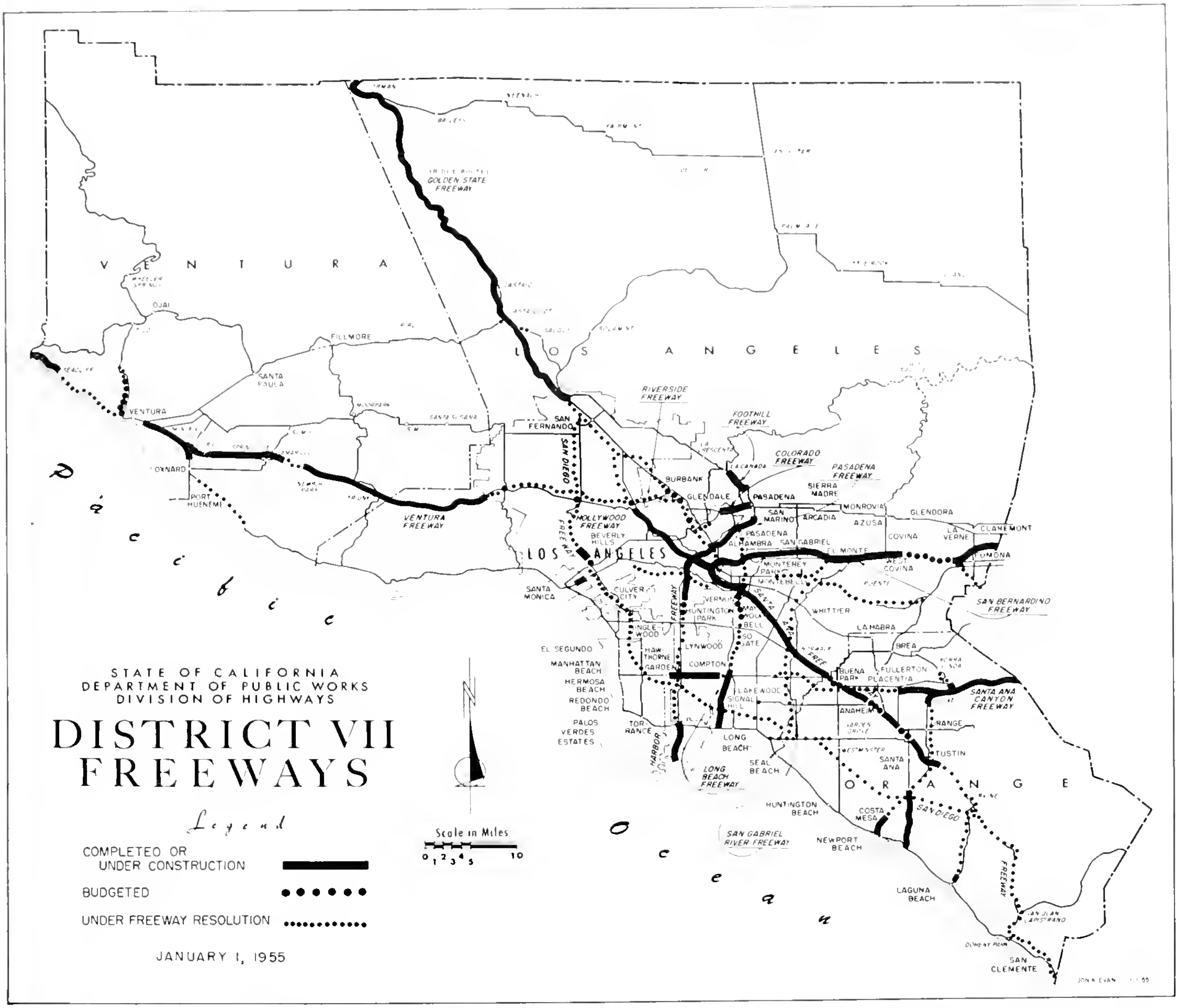
This analysis demonstrates very forcibly the truth of the saying: "We pay for good roads whether we have them or not, but we pay more if we don't have them."

In addition to the direct benefits that can be evaluated as money savings for motorists using freeways there are many indirect benefits that should not be overlooked. These are well covered in the quotation that follows from the City of Los Angeles June, 1953, report entitled, "The Economy of Freeways," by Lloyd Aldrich, City Engineer, and by Hugo Winter and Lamar W. Gardner of the Street and Parkway Design Division:

"* * * there are of course many other direct and indirect benefits to the motorist and general citizenry which cannot be easily evaluated in monetary terms, though none the less real. Among these are stabilization or enhancement of property values, relief of existing overburdened surface arteries, doubling of the practical radius of real estate development on a travel time basis, increased access to recreational or cultural facilities, increased mobility in times of disaster emergencies, increased tourist travel, reduction of strain of driving, and all of the other well known advantages in betterment of transportation. The benefits to the large amounts of traffic continuing to use formerly heavily congested surface arteries after the freeway system is built are not usually visualized. Before and after surveys have shown that removal of through traffic from surface arteries to the freeway benefits community business, property values, surface travel time, and safety on the surface system. In addition, the intended use of the freeways by express busses will greatly increase the economic value of the freeways to the general public, of which the motorists comprise a large part. The monetary value of these benefits could very well amount to huge sums, since they are all so vitally integrated with the general financial health and progress of the region. It should be borne in mind that conversely to the benefits accruing from having good transportation, *if there were no freeways there would be the losses that the region would suffer without having them.*"

More and More Freeways

As of January 1, 1955, we had a total of 60 construction contracts under way for which the construction allotments total $61,770,000. Of these contracts 34 are for construction jobs on full freeways and the



total of these allotments is $43,754,300. This is an indication of the continuing recognition given to freeway needs in District VII. An additional 14 miles of full freeways are anticipated for completion during the year 1955.

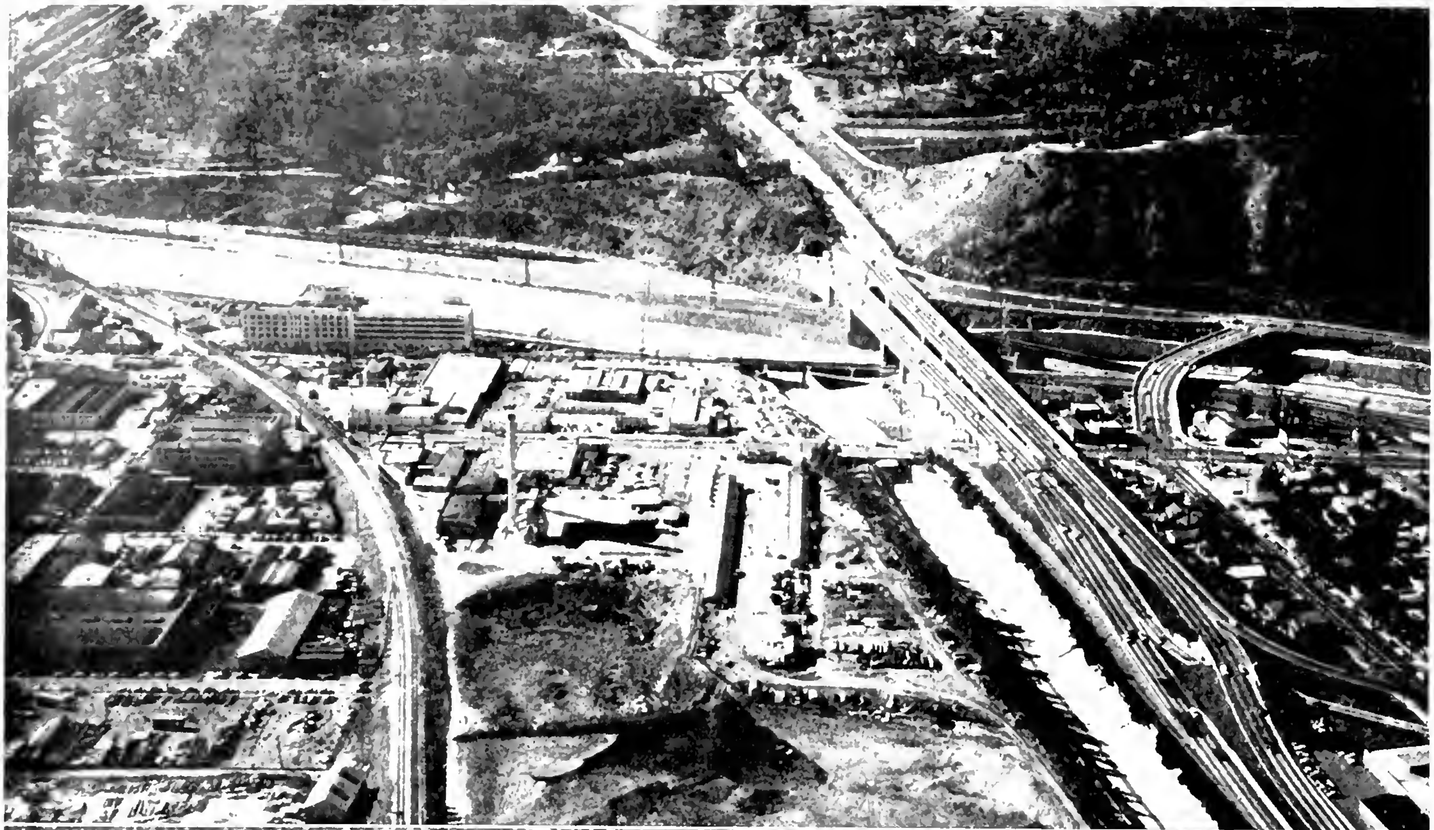
Good use was made during 1954 of the funds totaling $14,098,000 allocated to District VII for advance protective right-of-way acquisition. The money spent from this fund, in acquiring 747 parcels of property, that is often referred to as "Chapter 20 money"; for acquiring vacant, unimproved properties in the path of freeways to forestall expensive developments has now reached the total of $6,800,000. Big dividends will accrue to the State in later years to come because of these judicious expenditures, for if land now vacant is allowed to be subdivided and homes and industries built thereon the later costs of right of way acquisition may be increased many times over.

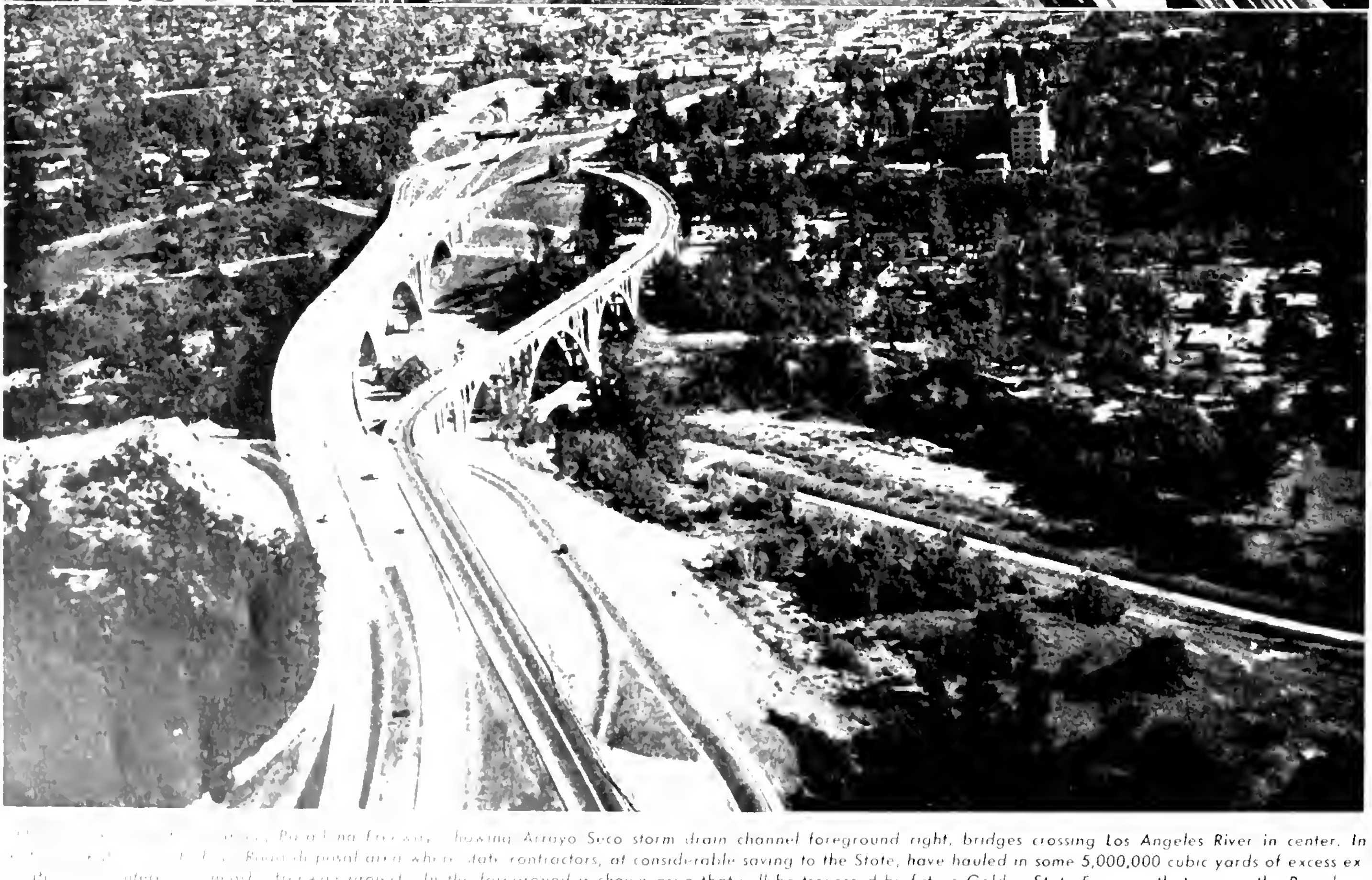
Progress Made

The accompanying map and tabulation showing status of District VII freeway projects indicate in a general way the progress that has been made. To date of January 1, 1955, a total of 166 miles of freeways and expressways have been completed in District VII and 50 miles are under construction. The total sum to date that has been expended for completed freeways, freeways in progress and right-of-way acquisition therefor is $336,973,000. The budget for the 1955-56 Fiscal Year recently adopted by the California Highway Commission allocates a total of $70,915,000 for expenditure upon District VII freeways. Thus, the total expended and obligated for District VII freeways is now $407,888,000, including Federal Aid funds.

PASADENA FREEWAY

With the completion of construction on the last one-half-mile link at the south end this freeway, formerly called the "Arroyo Seco Freeway,"





[illegible] Pasadena Freeway showing Arroyo Seco storm drain channel foreground right, bridges crossing Los Angeles River in center. In [illegible] disposal area where state contractors, at considerable saving to the State, have hauled in some 5,000,000 cubic yards of excess ex[illegible] freeway project. In the foreground is shown area that will be traversed by future Golden State Freeway that crosses the Pasadena Freeway at approximately right angles. LOWER: Looking easterly along Colorado Freeway showing Posadena Pioneers Bridge over Arroyo Seco on left and Old Colorado Street Bridge on right with Pasadena Civic Center and business district in background.

UPPER—Looking southerly from above Los Angeles along Pasadena-Harbor Freeway. Sunset Boulevard over Pasadena Freeway shown in foreground center. Four-level traffic interchange structure shown in foreground, with Hollywood Freeway extending from left to right. Portion of downtown Los Angeles business district shown above center left. LOWER—Looking northerly from above Los Angeles along Pasadena Freeway. Hollywood Freeway and four-level traffic interchange structure shown foreground, with City of Pasadena in background.

Looking easterly along Hollywood Freeway with four-level traffic interchange structure in center background and Los Angeles Civic Center buildings left background. This photograph shows late afternoon peak traffic flow.

on September 22, 1953, was fully completed and opened to traffic throughout its entire length of 8.2 miles, from the four-level traffic interchange structure in Los Angeles to Glenarm Street in Pasadena. On that date, for the first time, all levels of the unique traffic interchange structure and all connecting roadways were put into full operation. Recent traffic counts indicate that the average daily traffic on the southern portion of this freeway through the Elysian Park area is 110,000 vehicles per day. The northerly six miles of the Pasadena Freeway, from Avenue 26 to Glenarm Street, was completed and opened to public traffic on December 30, 1940.

HOLLYWOOD FREEWAY

Of particular interest is the final completion of the 10-mile Hollywood Freeway from Vineland Avenue in the San Fernando Valley to Spring Street in the Los Angeles Civic Center. The last major construction contract on the Hollywood Freeway was completed and accepted by Director of Public Works Frank B. Durkee on August 5, 1954. With the completion of construction throughout its entire length, public traffic has been quick to recognize the advantages which this freeway offers in safe and rapid transportation. We have found that the section between the four-level structure and Silver Lake Boulevard is carrying some 168,000 vehicles per day. This makes the Hollywood Freeway the world's most heavily traveled traffic arterial. The total cost of the Hollywood Freeway when all costs are in is expected to be $55,000,000 for the 10-mile total length.

The Hollywood Freeway extension joins the main Hollywood Freeway near the intersection with Lankershim Boulevard and extends northerly 6.8

miles to the proposed Golden State Freeway near Wentworth Avenue. District VII right of way agents have acquired 18 parcels on this unit with an expenditure in excess of $500,000, Chapter 20 money. The 1955-56 Fiscal Year budget has items totaling $4,-200,000 for further right of way acquisition and structures.

SANTA ANA FREEWAY

The Santa Ana Freeway, an important traffic arterial on the Interstate Federal Aid System, completed and proposed, is 42.8 miles in length extending from Spring Street in the Los Angeles Civic Center to the junction with the San Diego Freeway near El Toro in Orange County. Through the East Los Angeles area this freeway is carrying 90,000 vehicles per day.

During the month of November, 1954, a two-mile section of the Santa Ana Freeway from Pioneer Boulevard to Rosecrans Avenue in the Norwalk area was completed and opened to traffic. Adding this mileage to the previously completed section of the Santa Ana Freeway and the adjoining Hollywood Freeway, we now have a continuous full freeway with no stopping for traffic signals or cross traffic from Vineland Avenue in the San Fernando Valley through the Los Angeles Civic Center to Rosecrans Boulevard in Norwalk for a total length of 26 miles.

On July 6, 1954, a $2,400,000 contract for widening the existing bridge on the Santa Ana Freeway on Aliso Street over the Los Angeles River an additional 42 feet and more, as necessary, to provide for an eight-lane freeway with central dividing strip was awarded to Oberg Bros., construction contractors, and active construction is now in progress. A $1,050,000 contract on July 11, 1954, to build grade separation structures at the signalized intersections between Rosecrans Avenue and the Orange county line, was awarded to Ukropina, Polich, Kral & Ukropina, and work on these bridge structures is now under way. Construction is in progress under a state contract about 60 percent completed with Winston Bros. Company for extending the Santa Ana Freeway in Orange County a distance of 2.5 miles southerly from First Street, Santa Ana, to Browning Avenue, just beyond the south city limits of Tustin.

The 1954-55 Fiscal Year budget provided $3,828,000 for construction of portions of the Santa Ana Freeway between Broadway in Santa Ana and the Orange County-Los Angeles County line. A construction contract is now advertised for work to be financed from this item from Broadway to Lewis Street, and bids were opened January 20, 1955. The State Highway Commission on August 26, 1954, allocated an additional $450,000 for the construction during the 1954-55 Fiscal Year of an overcrossing bridge to carry Harbor Boulevard in Orange County over the Santa Ana Freeway. Contract for this work was awarded to J. A. Thompson & Son of Inglewood on November 26, 1954, and construction is now in progress.

Much of the Santa Ana Freeway in Orange County is now on an expressway basis with the grade intersections of cross-traffic arterials channelized and signalized. In the budget for the 1955-56 Fiscal Year, sufficient additional funds have been set up, the total amount being $5,942,000, to convert substantially all these remaining sections of expressway to full freeway status. During 1955, freeway construction will be put under contract to achieve this through the City of Buena Park and the City of Anaheim. All this freeway construction should be completed in 1957, at which time motorists will have the use of 35 miles of full freeway from the Los

Looking northwesterly along completed Santa Ana Freeway bypassing the main business and residential areas of the City of Santa Ana. In the foreground is Fourth Street Bridge over the freeway and in background bridge carrying Santa Fe railroad mainline between Los Angeles and San Diego. Extensive replacement of orange groves with housing projects will be noted.

Angeles Civic Center to Browning Avenue, joining existing US 101, two miles southeasterly of Santa Ana.

Outbound traffic on Santa Ana Freeway

SAN BERNARDINO FREEWAY

The total length of the San Bernardino Freeway, formerly called "Ramona Freeway," between the junction with the Santa Ana Freeway at the Aliso Street Bridge over the Los Angeles River to the San Bernardino county line is 30.8 miles. The San Bernardino Freeway is now completed outbound from the junction with the Santa Ana Freeway in Los Angeles easterly to Rosemead Boulevard east of Alhambra, a distance of 9.3 miles. The \$3,588,000 construction contract with Guy F. Atkinson Company of San Francisco for 6.3 miles of the San Bernardino Freeway through the Cities of Pomona and Claremont, from San Dimas Avenue to the San Bernardino county line, was opened to public traffic December 1, 1954. On this same date 7.2 miles of completed construction adjoining in District VIII extending through Upland and Ontario to Archibald Avenue in San Bernardino County was opened to traffic.

On June 17, 1954, bids were opened for 2.9 miles of the San Bernardino Freeway between Durfee Avenue and Puente Avenue, this section lying between the City of El Monte and the City of West Covina. The Griffith Company of Los Angeles submitted the low bid and was awarded the contract, which carries an allotment of \$3,550,000. Construction work on this contract is now in progress, and proceeding at a rapid rate.

Governor Breaks Ground

Led by Governor Goodwin J. Knight ground-breaking ceremonies were held on September 22, 1954, to celebrate start of work by the Peter Kiewit Sons' Company, Inc., of Arcadia on the 3.9-mile unit of the San Bernardino Freeway through the City of El Monte. Construction extends from Rosemead Boulevard to the San Gabriel River and the contract allotment is for \$6,400,000. This is the largest single contract that has been awarded to date for state highway construction.

The State Highway Commission on August 26, 1954, allocated an additional \$3,630,000 for construction during 1954-55 Fiscal Year of 4.2 miles

LEFT—Looking easterly along completed Santa Ana Freeway from under Alameda Street Bridge, showing late afternoon peak traffic. RIGHT—View looking southeasterly along completed Hollywood Freeway showing late afternoon peak traffic at junction with inlet ramp for outbound Highland Ave. traffic. In background is fine residential area known as "Whitley Heights" and off the photograph to the right is the Hollywood Bowl.

of the San Bernardino Freeway from the west city limits of West Covina to Citrus Avenue. Contract for this unit was awarded to Winston Bros. Company of Monrovia on November 12, 1954, and construction is now well under way.

On October 20, 1954, the California Highway Commission made a further allocation of $2,890,000 for grading, paving and structures for 4.2 miles of six-lane freeway on the San Bernardino Freeway from Citrus Avenue in West Covina to San Dimas west of Pomona. Bids will be opened for this construction project February 3, 1955. An approximation as to the time of completion would be December, 1956. The building of this last construction unit of the San Bernardino Freeway will complete full freeway construction from near the Los Angeles Civic Center to east of Ontario in San Bernardino County, a distance of 38 miles. Of this, 7.2 miles at the easterly end is in District VIII.

The average daily traffic using the Los Angeles end of the completed San Bernardino Freeway, according to recent counts taken near Soto Street, is 80,000 vehicles per day.

At the Los Angeles end Contractor Charles MacClosky is building an overhead bridge to serve as a traffic interchange roadway so that westbound traffic on the San Bernardino Freeway can travel southerly on the Santa Ana Freeway without making the two left turns at Mission Road that are now required. This contract carrying an allotment of $514,000 is 75 percent completed. The estimated date of completion is April, 1955.

Looking easterly along San Bernardino Freeway in East Los Angeles area approaching Soto St., showing peak hour outbound traffic in late afternoon

HARBOR FREEWAY

The Harbor Freeway from the intersection with the four-level traffic interchange structure near the Los Angeles Civic Center to Battery Street in the San Pedro area is 22.4 miles in length. Of this amount three miles from the four-level traffic interchange structure to 23d Street and Flower Street, has been completed and open to traffic. Near the four-level interchange recent traffic counts indicate an average daily traffic of 125,000 vehicles. A contract was awarded April 1, 1954, to J. E. Haddock, Ltd., of Pasadena, for extending the Harbor Freeway construction from 23d Street southerly to 42d Street. The contract allotment for this 1.4-mile contract is $3,658,200. This contract is proceeding at a very rapid rate with work well ahead of schedule and about 50 percent complete. The scheduled date for completion is November, 1955.

On June 30, 1954, Director of Public Works Durkee awarded a contract to the Vinnell Co., Inc., for the construction of a 2.8-mile section of the Harbor Freeway at the southerly end from Pacific Coast Highway to Battery Street in the San Pedro area. Construction on this contract is now in progress with work 30 percent completed. Contract allotment is $3,385,800.

The 1955-56 Fiscal Year budget contains items totaling $8,420,000 for extending right of way acquisition and construction on the Harbor Freeway. This will finance construction of this eight-lane freeway to carry it from 42d Street to southerly of Manchester Avenue, State Sign Route 10.

LONG BEACH FREEWAY

The total length of the Long Beach Freeway from Pacific Coast Highway (Route 60) in Long Beach to Huntington Drive approaching the City of Alhambra is 21.5 miles. As of the present time, 7.0 miles have been completed from Pacific Coast Highway northerly to the crossing with Atlantic Boulevard east of the City of Compton. Also recently completed

Looking easterly along San Bernardino Freeway from above City of Pomona with Ganesha Park in foreground left and Garey Ave., State Sign Route 71, in center.

in the East Los Angeles area are two railroad grade separation bridges to carry the Long Beach Freeway over the Santa Fe Railroad freight yards and the Union Pacific Railroad freight yards. Both of these structures are about one-fourth mile long and the construction cost of these two is $2,660,000.

On July 22, 1954, a contract was awarded to Ukropina, Polich, Kral and Ukropina for freeway construction and eight bridges between Sheila Street and Verona Street where junction is made with the Santa Ana Freeway. The contract allotment for this construction is $2,692,000. The work is 35 percent completed.

The Webb & White contract for the superstructure of the Long Beach Freeway bridge over the Los Angeles River that carries an allotment of $733,600 is about 26 percent complete.

Financed from a 1954-55 Fiscal Year budget item of $345,000, bids were received on January 27, 1955, for a railroad underpass bridge for the Los Angeles Junction Railway and appurtenant construction near Slauson Avenue.

For continuing construction and right-of-way acquisition on the Long Beach Freeway items in the 1955-56 Fiscal Year budget total $8,888,000.

GOLDEN STATE FREEWAY

On the portion of the Golden State Freeway, U. S. Highway 99, locally known as the "Ridge Route" between Tunnel Station and the Kern county line, 45.2 miles in District VII has been converted to a four-lane expressway. The total cost of this reconstruction, completed February, 1953, was $13,500,000.

Combined with adjoining completed reconstruction in District VI, the motoring public of California now has the use of 115 miles of completed continuous four-lane divided highway from Tunnel Station at the north city limits of Los Angeles to the Delano Underpass in Kern County near the Tulare county line. Under construction on the Golden State Freeway southerly of Tunnel Station to provide junction with State Highway Routes 23, 157 and 158, is the construction by Griffith Company, contractors, of 3.0 miles of freeway with a contract allotment of $4,400,000. This is scheduled for completion June, 1955.

The route adoption and freeway resolution for the last remaining unit of the Golden State Freeway to connect it with the Santa Ana Freeway was passed by the California Highway Commission June 24, 1954. The overall length of the Golden State Freeway in District VII extending from the Santa Ana Freeway northerly to the Kern county line is 72.7 miles.

Chapter 20, advance right-of-way money, in the amount of $360,000 has been utilized in acquiring six parcels of land for future construction on this freeway.

The budget for the 1955-56 Fiscal Year contains items for right-of-way acquisition and construction totaling $20,650,000.

VENTURA FREEWAY

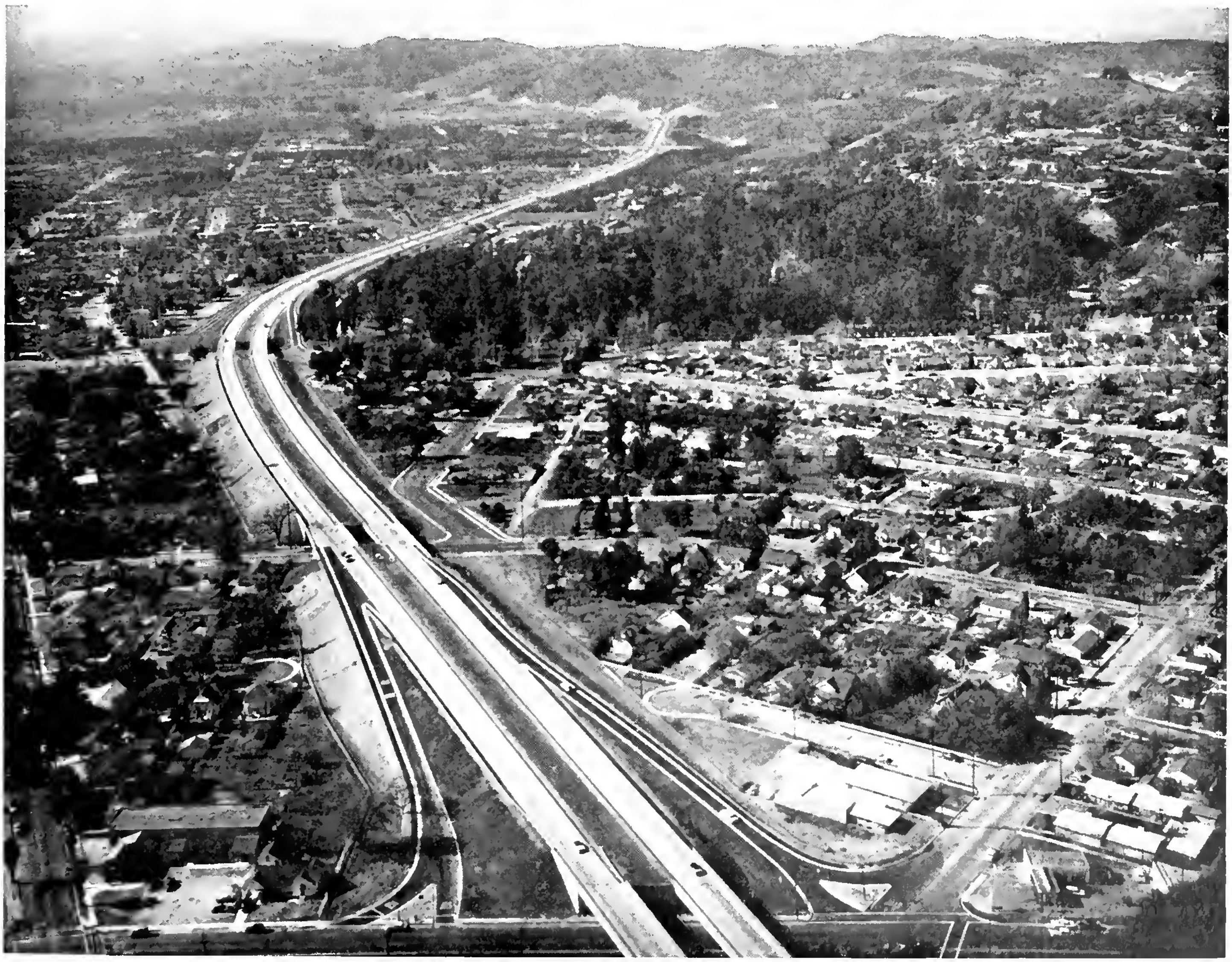
The Ventura Freeway extends from the Hollywood Freeway near Vineland Avenue in the San Fernando Valley to the Santa Barbara county line, a distance of 65.1 miles. Of this mileage, 32.7 miles have been completed at a construction cost of $8,000,000 to four-lane divided highway or expressway standards. This completed construction is all westerly of the west city limits of Los Angeles at Calabasas. Within the City of Los Angeles, the State Highway Commission has adopted freeway resolutions covering 16 miles of the Ventura Freeway from the westerly city limits of Los Angeles near Calabasas to the existing terminus of the Hollywood Freeway.

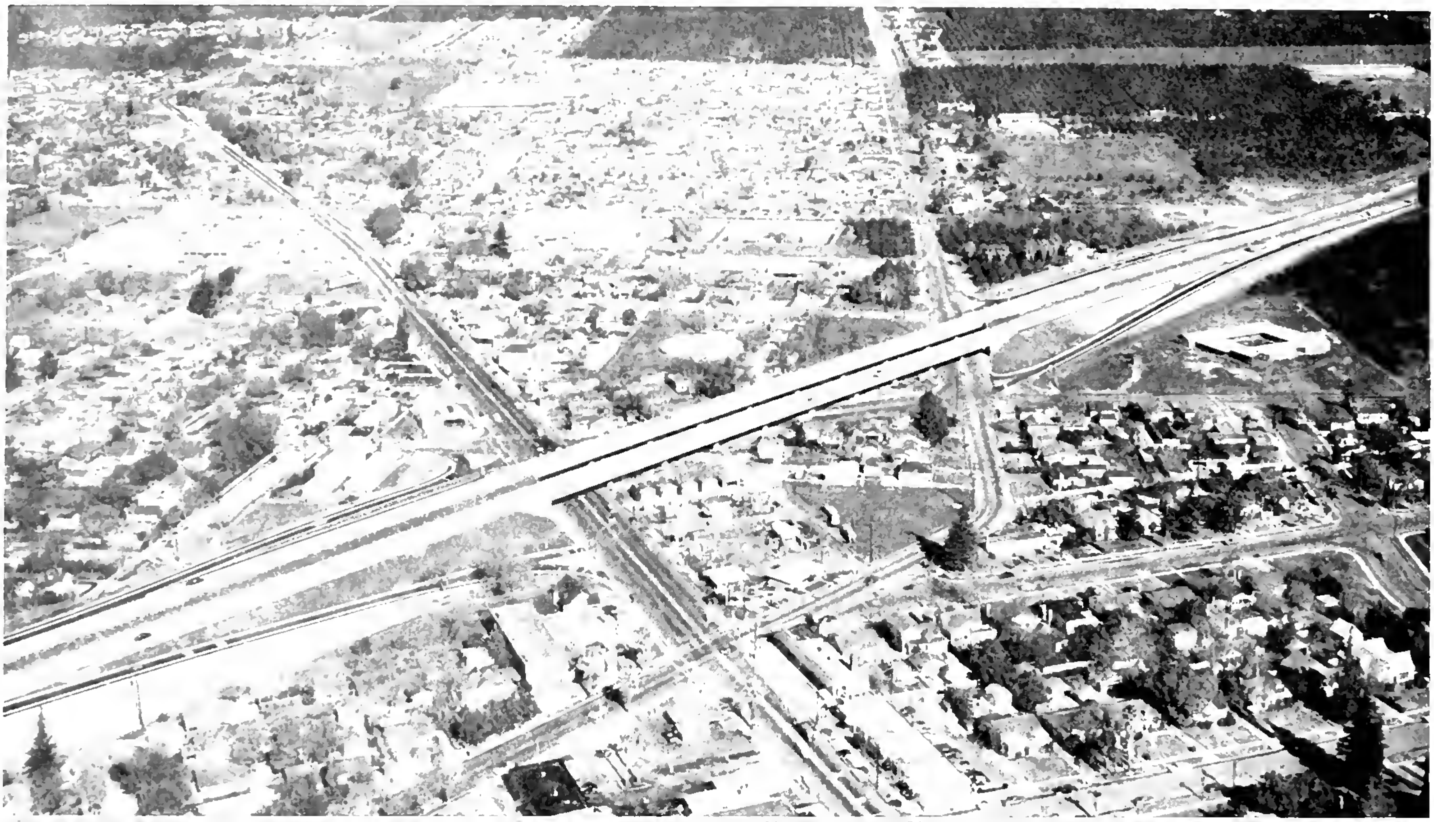
In acquiring rights of way for future construction between Sepulveda Boulevard and Calabasas in the City of Los Angeles, $2,740,000 has been expended from Chapter 20, advance right-of-way money.

The 1955-56 Fiscal Year budget contains items for construction and right-of-way acquisition in the total amount of $7,300,000.

The California Highway Commission announced on December 15, 1954, that it is considering the adoption of a freeway routing to carry the Coast Highway (U. S. Highway 101) through the City of Ventura. State Highway Engineer G. T. Mc-

Looking westerly along San Bernardino Freeway from above City of Pomona, showing Garey Ave., State Sign Route 71, at bottom of picture. Wooded area encircled by freeway is Ganesha Park.





UPPER—Looking [illegible] showing portion of San Bernardion Freeway with combination grade separation structure spanning over Garey Ave., State Sign Route 71, McKinley Ave. and Orange Grove Ave. LOWER—Looking easterly from above Los Angeles along San Bernardino Freeway with construction activities shown in foreground of [illegible] Bros. Construction Company for widening bridge over Los Angeles River and Charles MacClasky for traffic interchange structure to take westbound motorists from San Bernardino Freeway southbound on Santa Ana Freeway.

Coy has recommended a route which would extend five and one-half miles from west of Telephone Road to one mile west of Ventura.

SAN DIEGO FREEWAY

On the part of the San Diego Freeway, formerly called the Sepulveda Freeway, between the San Fernando Reservoir and the Long Beach Freeway, a distance of 33 miles, $9,000,000 has been spent to date for right-of-way acquisition at critical locations in order to acquire rights of way in advance of extensive improvements to private property where delay would have made future right-of-way acquisition costly. Of this sum about $3,-400,000 was chapter 20 advance right of way money.

The first unit of construction on this freeway was for structures between Waterford Street and Casiano Road, and bids were opened on August 26, 1954. This construction includes the grade separation bridge to carry Sunset Boulevard over Sepulveda Freeway and three other bridges. It is being financed from a 1954-55 budget item of $900,000. Award of contract to George W. Peterson and Jack W. Baker of La Canada was made on September 13, 1954, on basis of their low bid amounting to $722,-657.60. Ground-breaking ceremonies at which Governor Goodwin Knight officiated were held September 20, 1954.

The California Highway Commission at its November meeting in Sacramento designated the San Diego Freeway as extending from the Golden State Freeway near San Fernando to San Diego. Thus the San Diego Freeway in District VII includes all of the formerly called Sepulveda Freeway and the portion of the previously called Santa Ana Freeway from El Toro in Orange County to the San Diego county line, a distance of 96 miles. In Orange County, through and adjacent to the City of San Clemente $984,000 of Chapter 20 money has been expended in the acquisition of 358 parcels of right of way for future construction. Items for construction and rights of way in the 1955-56 Fiscal Year budget total $4,405,000 for the San Diego Freeway.

In October, 1954, the California Highway Commission made additions to the 1954-55 Fiscal Year budget totaling $3,200,000 for construction on the San Diego Freeway. From these funds it is expected, early in 1955, to advertise and award contracts for constructing 1.2 miles of eight-lane freeway in the vicinity of Sunset Boulevard, and to build miscellaneous structures.

COLORADO FREEWAY

One and six-tenths mile of the Colorado Freeway in the City of Pasadena from Holly Street to Avenue 64 has been completed and opened to public traffic. This includes the new six-lane freeway bridge over the Arroyo Seco near the Rose Bowl and just northerly of the Colorado Street Bridge. A contract was awarded on June 14, 1954, to Peter Kiewit Sons Co. for extending this freeway from Avenue 64 westerly for three-fourths mile to Wiota Street as a full freeway and for one-fourth of a mile as a divided highway to Eagle Vista Drive where it joins a previously completed divided highway on Colorado Boulevard through the Eagle Rock section of Los Angeles. The contract allotment for this construction work that is now in progress is $988,000 and the estimated date of completion is August, 1955. To date there has been spent or obligated on this freeway for rights of way and construction a total of $13,264,700. The average daily traffic on the Colorado Freeway at Linda Vista Avenue connection is 30,000.

The construction work, completed and in progress, on the Colorado Freeway is to correct serious traffic congestion conditions on State Highway Route 161 between Pasadena and Eagle Rock, and it extends over all of the freeway route that has been adopted by the California Highway Commission.

FOOTHILL FREEWAY

Construction by Contractors Peterson & Baker and Dragline Rentals Co. on the Foothill Freeway, State Sign Route 118, from Hampton Road in the Flintridge area to Montana Street in Pasadena, is now in progress and about two-thirds completed. The total of the contract allotment is $1,922,700. The total length of this contract is 1.8 miles and to date a total of $2,-600,000 has been spent and obligated for right-of-way acquisition and construction.

This construction will relieve a very severe traffic congestion situation that has existed for many years where present State Highway Route 9 crosses the Arroyo Seco on the narrow curving roadway located on Devil's Gate Dam.

ALLESANDRO FREEWAY

An application has recently been filed with the State Public Utilities Commission relative to the crossing of this freeway with the Southern Pacific Railroad. This is a badly needed freeway project since the existing State Highway Sign Route 2 at this location makes a grade crossing with Southern Pacific Railroad mainline tracks. Vehicular traffic delays at this railroad grade crossing are numerous and lengthy because of the large number of passenger train and freight train movements.

Just northerly of the Southern Pacific Railroad grade crossing is the intersection with San Fernando Road, U. S. Highways 6 and 99. This proposed unit of freeway construction will also eliminate the existing acute traffic congestion at this important highway intersection.

Right-of-way acquisition on the Allesandro Freeway for the 1.2 miles lying easterly of Fletcher Drive between the Los Angeles River and Avenue 36 near Eagle Rock Boulevard has been substantially completed. The total expenditure to date for right-of-way acquisition is $2,890,000.

ARTESIA FREEWAY

The California Highway Commission has adopted as a freeway two sections of State Sign Route 14 totaling 21.7 miles. These sections cover 8.8 miles from Normandie Avenue to Santa Fe Avenue in Los Angeles County and 12.9 miles from Palo Verde Avenue to Santa Ana Canyon Freeway in Orange County. Between these two sections a six-mile length of this route has recently been completed as a divided highway.

Looking northerly along completed Harbor Freeway, showing normal traffic use. The two bridges in foreground are for Fourth Street traffic. When cooperatively financed $1,400,000 construction contract now in progress has been completed for extending Fourth St. from Flower St. to Hill St., Fourth St. and Third St. will be put into operation as a pair of one-way streets similar to the one-way operation of Fifth and Sixth Sts., and Eighth and Ninth Sts.

State Sign Route 14 is a very important traffic arterial giving direct communication between the coastal cities of the Santa Monica Bay area with inland parts of Orange County, Riverside County and easterly. Some six miles of this route at the westerly end have been completed to four-lane divided highway standards. On August 17, 1954, a double bridge at the easterly end to provide for four traffic lanes was completed over the Santa Ana River at a cost of $465,000.

Three construction contracts are now in progress on this route for carrying out construction on an expressway basis. Total cost to date including right-of-way acquisition is $5,245,500.

SANTA ANA CANYON FREEWAY

State Highway Sign Routes 18 and 55, from Newport Beach to Riverside county line, a distance of 21.7 miles, for those sections being developed on a divided highway or expressway basis and covered by freeway resolutions by the California Highway Commission, are being called the Santa Ana Canyon Freeway because approaching Riverside County this freeway for many miles is located in the Santa Ana Canyon. Of this distance a length of 11 miles in the Santa Ana Canyon has been completed as a four-lane expressway and two miles through the City of Costa Mesa on an expressway and divided highway basis. This divided highway construction has been extended easterly into Riverside County in District VIII.

The total expenditure for right of way and construction to date on this freeway route is about $5,000,000.

OTHER DISTRICT VII FREEWAYS

In addition to the freeways listed in the accompanying summary and discussed herein there are 105 miles of freeway routings that have recently been adopted by the California Highway Commission that should be mentioned.

Considerable progress has been made in preparation of plans for the Ojai Freeway in Ventura County, U. S. Route 399, from Coast Highway (US 101) to Foster Park. Considerable right of way has been obtained in anticipation of a construction project to be advertised during 1955 for a four-mile length of four-lane freeway for which the budget allocation is $2,000,000.

On May 21, 1954, the California Highway Commission adopted a routing for the portion of the Olympic Freeway, State Sign Route 26, 9.6 miles in length, from junction with the Santa Ana Freeway to La Cienega Boulevard within Los Angeles City. Since that time designing and plan preparations have been going forward and many areas have been certified for right-of-way acquisition for the part of this freeway through the industrial area easterly of the Harbor Freeway. In the budget for the 1955-56 Fiscal Year $6,250,000 was allocated by the California Highway Commission for the start of right-of-way acquisition on the Olympic Freeway.

Commission Action

On November 22, 1954, the California Highway Commission issued a statement addressed to some 2,000 interested citizens in the San Fernando Valley area of the City of Los Angeles that were on the mailing list, relative to the action taken by the commission on November 18, 1954, adopting 10.9 miles of the Riverside-Ventura Freeway, extending from junction with the Golden State Freeway, State Highway Route 4, west-

Looking northerly along completed Harbor Freeway from above Los Angeles showing downtown business buildings and Civic Center buildings in center and toward background. The grade separation bridge, foreground left, carries Pico Blvd. under the Harbor Freeway. The four-level traffic interchange structure and Hollywood Freeway are shown background left.

erly to Sepulveda Boulevard. The statements were sent out to those citizens and property owners who had previously written in to the State Highway Commission for information or who had identified themselves at the public hearing held on July 14, 1954. This statement went to considerable length to explain the various proposed routings that had been studied and the reasons behind the commission's decision in adopting the line chosen as the route for the freeway.

The California Highway Commission on December 15th adopted a routing for the proposed San Gabriel River Freeway, which will run approximately 23 miles from the vicinity of Long Beach is a junction with the San Bernardino Freeway.

Looking northeasterly from above Los Angeles showing completed portion of the Harbor Freeway extending from foreground right to center left. Downtown business district and Civic Center shown center and right. The grade separation bridge, foreground right, carries Olympic Blvd. under the Harbor Freeway. Next above Olympic Blvd. is Ninth St. that carries one-way traffic eastbound, and above it is Eighth St. which carries one-way traffic westbound.

The route adopted is that recommended to the commission by State Highway Engineer McCoy. It follows in general the easterly portion of the San Gabriel River floodplain.

Freeways in the Los Angeles Metropolitan Area Not on the State Highway System

There are three such freeway projects that should be mentioned:

The Terminal Island Freeway from Seaside Boulevard to Willow Street is 3.1 miles in length and cost approximately $12,000,000. This freeway was designed by the State Division of Highways, constructed under State and Navy contracts, and financed by Navy and U. S. federal aid funds. The State Division of Highways was reimbursed in full for all expenditures made for engineering right-of-way acquisition and construction.

The Long Beach Freeway from Pacific Coast Highway to the Long Beach Harbor area, a length of 1.6 miles being beyond the southerly terminus of State Highway Route 167, has been and is being designed, constructed, and financed by the City of Long Beach. The estimated cost of this freeway is $12,000,000.

A 2.0-mile unit of the La Cienega Freeway in the Inglewood area has been designed, constructed and financed by the Los Angeles County Road Department at a cost of approximately $2,000,000.

Freeway System for Los Angeles Metropolitan Area

The so-called Los Angeles metropolitan area has rather vague boundaries. Sometimes it is taken to embrace the entire county, including portions of adjoining Ventura County and Orange County. Usually the Los Angeles metropolitan area is considered to be the 1,233 square miles of the Los Angeles County coastal plain. Roughly speaking, the County of Los Angeles is divided approximately one-third coastal plains, one-third mountains, and one-third in land valleys.

Thus, the freeway system for the Los Angeles metropolitan area is generally considered to be that system for the coastal plain areas that was established by the Regional Planning Commission of the County of Los Angeles and incorporated in the "Interregional Regional Metropolitan Freeways in the Los Angeles Metropolitan Area" that was presented to the California Legislature March 30, 1946, by the Los Angeles Parkway Engineering Committee. This report showed 613 miles of freeway as being on this system. At that time it was considered that 165 miles of these so-called "parkways" were a responsibility of the State Division of Highways for a 10-year period of construction.

It should be pointed out that the Division of Highways in its present freeway construction program is not completing the entire freeway system that was visualized in 1946 for the Los Angeles metropolitan area. The State is now accepting ultimate responsibility for some two-thirds of the mileage of this over-all system, and of course for many miles of full freeways and expressways in Orange and Ventura Counties outside the limits of the so-called metropolitan system.

Under the present accelerated construction program it can reasonably be expected that within the next 10-year period the State will be able to complete the state highway freeway routes in District VII, either to expressway or full freeway standards. However, the Los Angeles metropolitan area needs many other freeways that are not a state responsibility.

The *Town Hall of Los Angeles* released December, 1954, a report entitled, "The Traffic and Transit Problem of the Los Angeles Metropolitan Area." This sets up the problem very clearly, explaining the tremendous growth of population in the Los Angeles metropolitan area and the corresponding increase in motor vehicle registration. The 1954 mid-year motor vehicle registration statewide was 5,716,341. Of this amount there were registered in Los Angeles County 2,363,216.

Traffic Problem

In explanation of the traffic problem in the Los Angeles area there is quoted from *Town Hall* the following:

"Travel to and from work is the principal cause of traffic congestion at peak hours. Those persons who use their cars during the day in the conduct of their business or work also contribute to the congestion at peak hours.

"Many daily trips are made for shopping purposes. The increased use of the automobile for this purpose has led to the mushroom growth of supermarkets and suburban department stores, where parking facilities often take up more space than the store buildings themselves.

"Although neighborhood communities are more nearly self-contained and offer more diverse attractions than in earlier years, many cultural and recreational activities draw people long distances from their homes. In the Los Angeles area, also, most persons tend to have friends in various parts of the community rather than concentrate in their own neighborhood.

"In short, whether for earning or spending money, or merely enjoying the opportunities of life in this large urban community, to live is to travel. To be confined, or to travel only with difficulty and expense, is to have one's life correspondingly curtailed."

Population Impact

In commenting upon Los Angeles' problems, Charles Detoy, President of the Los Angeles Chamber of Commerce for 1954, recently said:

"If the entire population of Pittsburgh and Baltimore—1,755,000—were transported westward and settled within the Los Angeles metropolitan area you would have a fair estimate of our population increase between January 1, 1945, and January 1, 1955.

"The impact of this migration, averaging nearly 500 new residents a day for 10 years, makes even seasoned statisticians sit up and take notice.

"While the city's population climbed from 1,725,000 in 1945 to its present estimated 2,150,000—a 24.6 percent increase—Los Angeles County became the most populous county in the Country, second in the world. The county jumped from 3,345,000 residents 10 years ago to 4,950,000 today, and hasn't stopped yet.

"With a 50 percent rate of increase for the metropolitan area chalked up during the past decade, a population larger than that of Albany, capital of New York, has been added to this area each year. Certainly the problems inherent in this number of increased residents stagger the imagination and resources of any community."

The problem has been well stated but satisfactory and complete solutions to this problem of adequate transportation for the Los Angeles metropolitan area have yet to be established.

A constructive step was taken when Mayor Norris Poulson of the City of Los Angeles and John Anson Ford, Chairman of the Los Angeles County Board of Supervisors, on February 18, 1954, appointed a 45-member com-

UPPER—Looking northerly along right of way that has been cleared of buildings for future construction on the Harbor Freeway. The traffic arterial on left is Figueroa St., next is Broadway and beyond is Main St. The east and west cross street, portion of which is shown foreground right, is Florence Ave. LOWER—Looking northerly along section of Harbor Freeway under construction between 23d St. shown just above center and 42d St. at right beyond limits of picture. The Los Angeles Memorial Coliseum is shown foreground left and Los Angeles downtown business district and Civic Center buildings, background right.

mittee. This committee was called "Citizens Traffic and Transportation Committee," and it was composed of representatives with widely divergent interests and from all communities in the Los Angeles metropolitan area. Robert Mitchell, the first chairman, also president of several other prominent civic organizations, heads a rock product firm with headquarters in Vernon, and Robert L. Gordon, the first vice chairman, is Vice President of the Bank of America. Upon Mr. Mitchell's recent resignation Mr. Gordon was appointed chairman.

Panel of Consultants

Early in its deliberations this committee found the need of advice, consultation and guidance from persons who by their professional knowledge and experience were qualified as experts in the field of traffic and transportation. On May 5, 1954, a panel of professional and expert consultants to the Citizens Traffic and Transit Committee was created. This panel consisted of 12 business and professional men whose field of endeavor put them in close contact with transportation needs of the Los Angeles metropolitan area. Since that time four additional members have been added to the panel of consultants. The panel chose Mr. Joseph Havenner, Manager of the Public Safety Department, Automobile Club of Southern California, as chairman.

As Mayor Poulson said recently: "The panel works hand in glove with the citizens committee to help it speed its study, and to suggest definite long-range projects and policies for consideration. The panel also will prepare a written report that will cover the metropolitan area problems being studied.

"What we are trying to do is to coordinate the best talent we can find to analyze the basic traffic and transportation situation so as to develop the most logical solution. We possess the men with the knowledge and ability to do this. As I see things, it is the responsibility of the city and county governments to provide a leadership coordinating the efforts of these citizens to crack our complex traffic and transportation problems."

Meanwhile, the State Division of Highways freeway construction program in District VII is now providing and, in the near future, will be providing in far greater measure, for the safe and expeditious movement of huge volumes of vehicles in the Los Angeles metropolitan area.

STATUS OF DISTRICT VII FREEWAY PROJECTS—JANUARY 1, 1955

	Total miles	Completed projects		Under contract		Right-of-way costs	Total costs to date
		Miles	Constr. costs	Miles	Constr. est.		
Pasadena Freeway:							
4-level structure to Glenarm St. Pasadena	8.2	8.2	$9,275,000			$1,009,100	$10,284,100
Hollywood Freeway:							
Spring St. via Cahuenga Pass to junction Golden State Freeway near Wentworth St.	16.8	10.0	28,543,500		$105,000	24,600,000	53,248,500
Santa Ana Freeway:							
Spring St. (Los Angeles) to junction of San Diego Freeway near El Toro	42.8	29.6	31,407,400	7.1	8,874,300	15,266,000	55,547,700
San Bernardino Freeway:							
Santa Ana Freeway near Los Angeles River to San Bernardino county line in Claremont	30.8	15.6	18,256,630	11.3	14,044,470	14,540,000	46,841,100
Harbor Freeway:							
4-level structure to San Pedro	22.4	3.0	10,955,500	5.7	7,696,700	43,600,000	62,252,200
Long Beach Freeway:							
Pacific Coast Highway in Long Beach to Huntington Drive in South Pasadena	21.5	7.3	8,584,600	3.3	4,963,800	14,215,000	27,763,400
Golden State Freeway:							
Junction of Olympic and Santa Ana Freeway near Soto St. to Kern county line	72.7	45.2	11,917,800	3.0	3,738,100	3,433,500	19,089,400
Ventura Freeway:							
Vineland Ave. to S. county line Ventura and N. county line Ventura to Santa Barbara county line	65.1	32.7	8,150,100	8.8	4,636,400	8,116,000	20,902,500
San Diego Freeway:							
Golden State Freeway near San Fernando Reservoir to San Diego county line	96.0			0.4	794,900	8,849,000	9,643,900
Colorado Freeway:							
Eagle Vista Dr. in Eagle Rock to Holly St. in Pasadena	2.5	1.5	5,021,100	1.0	1,102,600	7,141,000	13,264,700
Foothill Freeway:							
Hampton Rd. to Montana St. in Flintridge	1.8			1.8	2,003,400	624,000	2,627,400
Allesandro Freeway:							
Los Angeles River to Ave. 36, near Eagle Rock Blvd.	1.2					2,890,000	2,890,000
Artesia Freeway:							
Normandie Ave. to Santa Fe Ave. and Palo Verde Ave. to Santa Ana Canyon Freeway	21.7	0.4	465,200	7.6	3,415,800	1,406,800	5,245,500
Santa Ana Canyon Freeway:							
Newport Beach to Riverside county line	27.4	12.9	2,995,900			1,214,000	4,209,900
Other freeways covered by resolution of adoption by Highway Commission	104.6					3,162,700	3,162,700
Totals	535.5	166.4	$135,572,730	50.0	$51,375,470	$150,067,100	$336,973,000

Southern Crossing

Engineering Studies for Causeway-Tube Proceeding

By NORMAN C. RAAB, Projects Engineer

Engineering studies for an additional crossing of the bay between San Francisco and the East Bay communities are being made by the Division of San Francisco Bay Toll Crossings in accordance with the statutes enacted by the 1953 Session of the State Legislature.

Chapter 1056 of the Statutes of 1953, now codified as Article 2, Chapter 2, Division 17, of the Streets and Highways Code, directed the California Toll Bridge Authority to issue bonds to provide for the payment of engineering studies, plans, and specifications for an additional highway crossing of San Francisco Bay to relieve congestion of traffic on the San Francisco-Oakland Bay Bridge. It also specified that the new crossing, to be known as the "Southern Crossing," should have its westerly terminus in the vicinity of Third and Army Streets in San Francisco and its easterly terminus on Bay Farm Island, Alameda County. The Statutes further delineated in detail the approach connections to be built.

Army Approval Granted

The State Department of Public Works applied to the Corps of Engineers, U. S. Army, for permission to construct the Southern Crossing in the designated location. On April 8, 1954, approval was granted to construct a causeway-tube crossing between the selected termini and on a transbay alignment bowed southward as shown on the accompanying map.

From the sale of an additional series of bonds, supported by revenues from the San Francisco-Oakland Bay Bridge, $1,500,000 was made available to the Department of Public Works for the engineering investigation. On April 1, 1954, the Director of Public Works issued a directive to the division to proceed with the work. A separate section was organized at once within the division and its full efforts have been devoted exclusively to the Southern Crossing studies.

Attorney General Approves

The Southern Crossing statutes were studied and a preliminary layout of the entire project was prepared. This layout, together with a detailed description of the proposed approaches, was submitted to the State Attorney General for a ruling as to whether the provisions of the law were correctly interpreted. On August 20, 1954, assistant attorney general E. G. Funke, in a letter to the Division of Bay Toll Crossings, stated that the project as delineated on the accompanying plan, in his view, was in accord with the statutes.

The transbay crossing will be a six-lane causeway-tube 7.7 miles in length. Starting at the San Francisco shore near Army Street, vehicular traffic will travel eastward via a trestle viaduct approximately 5,300 feet long to a sand island. At this island traffic will enter one of three 5,800-foot-long subaqueous tubes, and will emerge at another sand island. Vehicles will continue across a low concrete trestle viaduct 22,000 feet long and thence via a 6,000-foot earthen mole to the southwest shore of Bay Farm Island.

Two 12-foot Traffic Lanes

Each of the three subaqueous tubes will carry two 12-foot traffic lanes. The tubes will pass beneath the navigation channel providing a minimum of 50 feet clear depth of water for a distance of 1,500 feet. At the tube portals two large artificial sand islands will be built. On each of the sand islands will be located:

(1) A portal building to house necessary ventilation equipment;

(2) A roadway transition section, and

(3) A light transition section to provide a gradual change of illumination intensity from the viaduct to the tubes.

Before the tubes can be placed, a deep trench in the bay bottom must be dredged to remove the soft undesirable foundation materials. In places excavation will reach a depth of 120 feet below sea level. In this trench will then be constructed the large sand islands and sand bed upon which the tubes will rest.

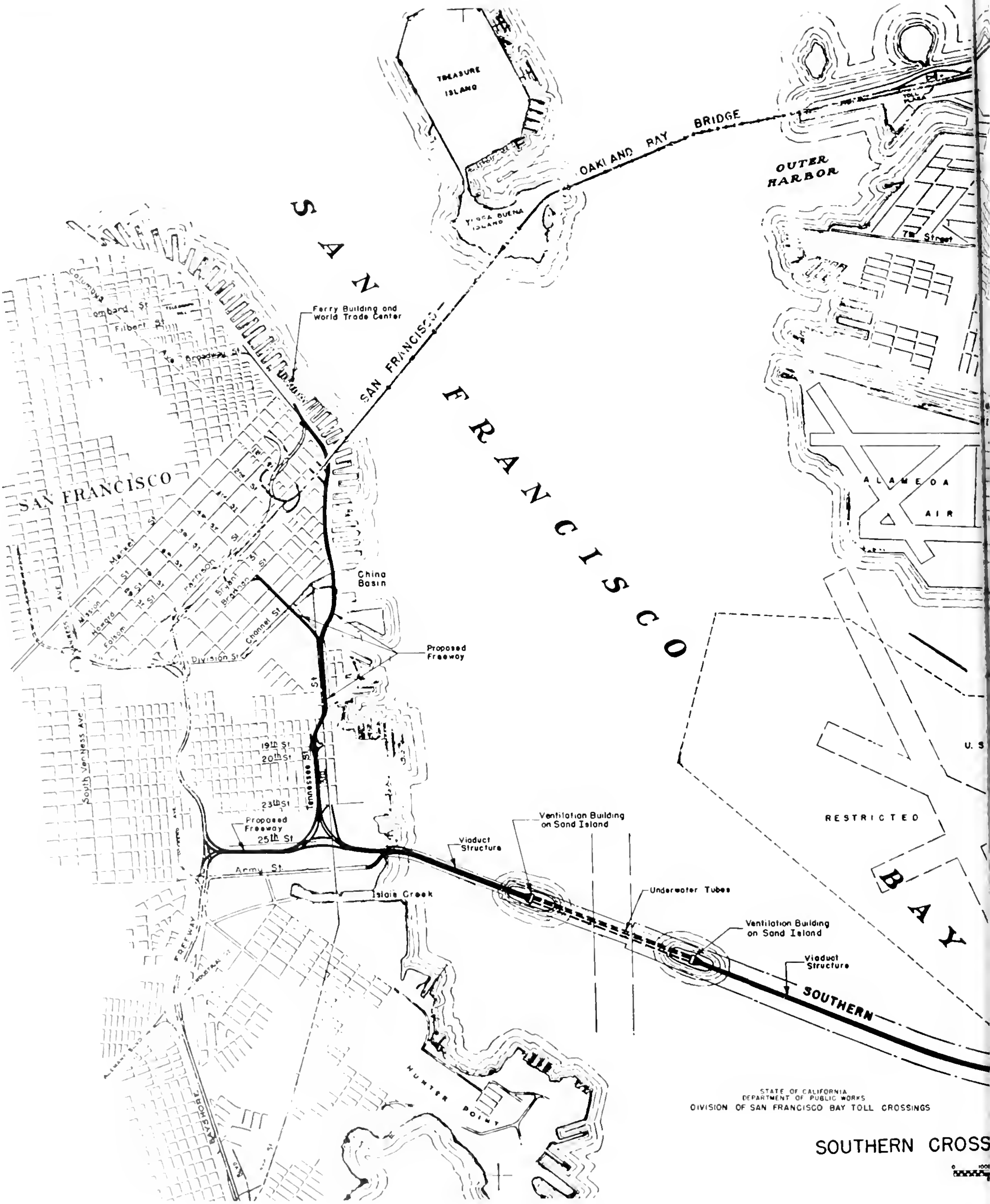
Precast Section Method

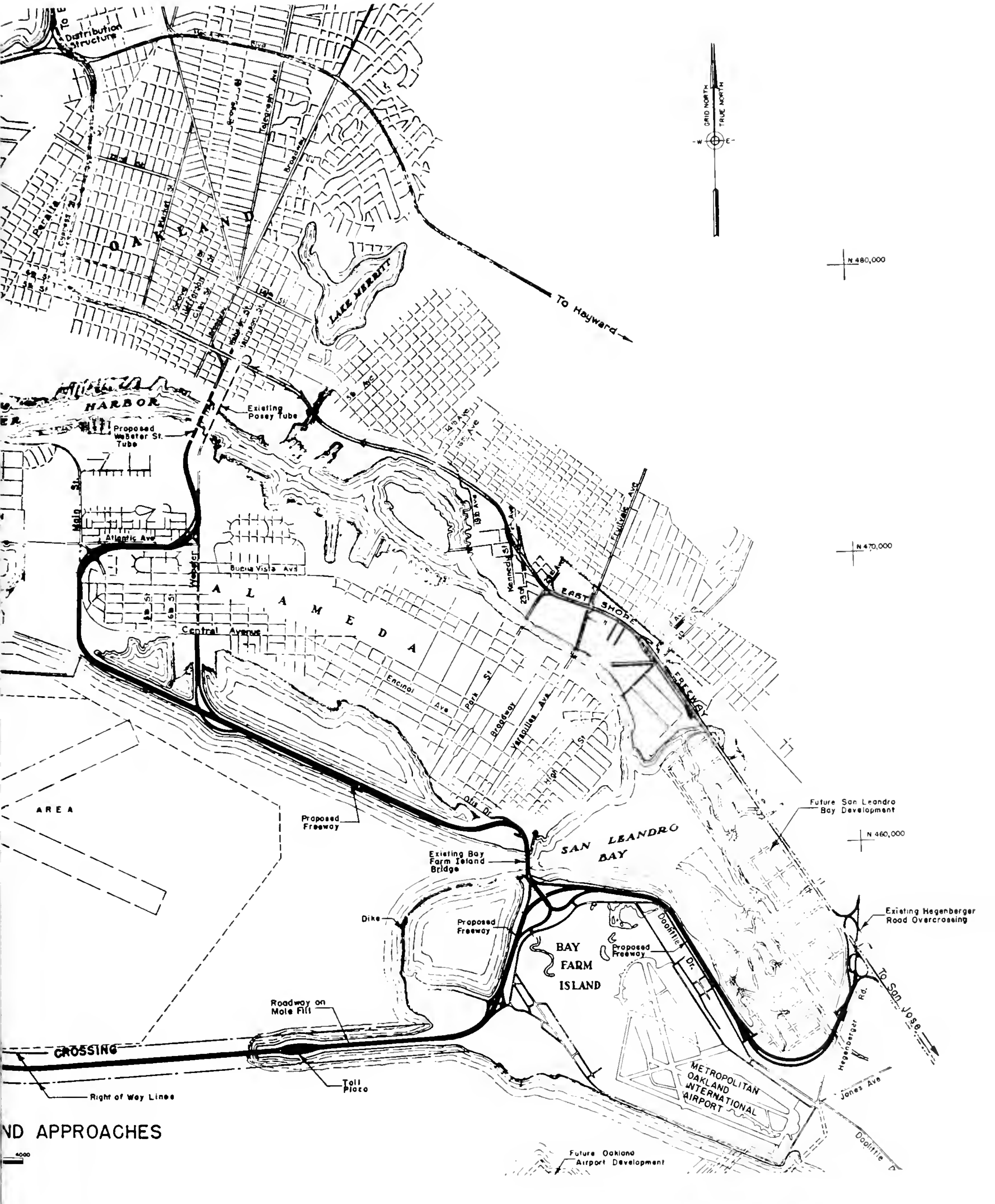
The precast section method of tube construction will be used. Each tube will consist of cylindrical precast reinforced concrete sections constructed in drydocks. After the open ends have been bulkheaded, these sections will be floated to the site. They will be sunk onto a sand blanket in the previously excavated trench and then covered with sand backfill. The individual tube segments will be connected by special joint details to insure structural continuity and watertightness. The method of construction is essentially the same as was used for the existing Posey Tube.

The viaduct structures, totaling about five miles in length, will accommodate three lanes of traffic on each of two parallel 38-foot roadways separated by a raised 6-foot median. They will be low level, reinforced concrete trestles consisting of a series of identical deck spans supported on concrete pile bents. Studies are being made of both precast and cast-in-place deck sections with span lengths ranging from 40 feet to 60 feet, and for both prestressed and nonprestressed designs.

Sand Fill Mole

The mole extending westward from Bay Farm Island will be constructed of sand fill placed by hydraulic means. Side slopes exposed to wave action will be protected by heavy riprap. Each of two parallel three-lane roadways on the mole will be 36 feet wide, separated by a 10-foot median, and with 8-foot shoulders along the outer lanes.


TREASURE ISLAND
YERBA BUENA ISLAND
OAKLAND BAY BRIDGE
OUTER HARBOR
7th Street
SAN FRANCISCO
SAN FRANCISCO
Ferry Building and World Trade Center
SAN FRANCISCO BAY
Lombard St
Filbert St
Broadway St
Columbus Ave
Market St
Mission St
Howard St
Folsom St
Harrison St
Bryant St
Brannan St
Channel St
Division St
China Basin
Proposed Freeway
19th St
20th St
23rd St
25th St
Tennessee St
South Van Ness Ave
Proposed Freeway
Army St
Islais Creek
Viaduct Structure
Ventilation Building on Sand Island
Underwater Tubes
Ventilation Building on Sand Island
Viaduct Structure
SOUTHERN
BAYSHORE
FREEWAY
HUNTER POINT
ALAMEDA AIR
RESTRICTED
BAY
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS
SOUTHERN CROSS



ND APPROACHES

Projects Engineer Norman C. Raab briefs press in San Francisco on Southern Crossing.

The toll plaza will be located on the offshore end of the mole fill. The administration and maintenance buildings will be located in the center of the plaza with eight toll lanes for unidirectional traffic on each side. All collections will be made on the driver's side of the vehicle. Truck tolls will be charged on the basis of number of axles rather than by weight.

Approach Facilities

The general approach facilities are shown on the accompanying map. Freeway standards will be used for design with maximum grades limited to $3\frac{1}{2}$ percent, except for the ramps where steeper grades are necessary. Each of the approach freeways will be either four- or six-lane.

The San Francisco approaches will consist of about five miles of freeway (mostly on elevated viaduct) connecting the Southern Crossing with the Bayshore Freeway, the proposed Embarcadero Freeway, and with the business and industrial areas of San Francisco.

The East Bay freeway approaches will total about 10 miles in length. The freeway crossing Bay Farm Island will branch at the northern end of the island, with one leg skirting around the south shore of San Leandro Bay and the east side of the Oakland Airport to a connection with the Eastshore Freeway at Hegenberger Road. The other leg will cross over the existing bridge between Bay Farm Island and Alameda, and thence will go northwesterly along the south shore of Alameda. This approach continues across Alameda to connections with the existing Posey Tube and with the proposed Webster Street Tube under the Oakland Estuary, and connects with Oakland city streets on the north side of the estuary.

Estimate of Materials

Present estimates indicate about 65,000 tons of reinforcing steel, one million cubic yards of concrete, $1\frac{1}{2}$ million barrels of cement, 10,000 tons of structural steel, and 14 million cubic yards of sand fill will be needed to construct the project.

The division will continue with the engineering investigations and will determine cost estimates for all sections of the project. A detailed and comprehensive report covering these engineering investigations and including cost, traffic, and financing phases will be made to the Director of Public Works by the end of 1955.

TRUCK LOADS

Continued from page 13 . . .

increases in loadings of vehicles or axles would not dangerously overtax these 975 bridges.

Bridges in Two Categories

The remaining 3,900, or 80 percent, of bridges may be divided into two categories. The first category consists of the older county-built bridges which are not considered capable of carrying many repetitions of the present legal loads and are posted accordingly. On state highways, these posted bridges are being replaced as rapidly as funds will permit; however, there are many such bridges on county roads throughout the State that would be affected by any increase in axle loads.

The greater number of the 3,900 bridges are in the second category, which consists of the state-built bridges that were designed for the standards in effect prior to adoption of the heavier H 20-S16 loading. It is calculated that the present legal loading on vehicles now using these older state-built bridges overstresses some of the structures as much as 15 percent, and occasional overloads produce overstresses in excess of 15 percent. Mention of these overstresses is not intended to create alarm. Experience to date indicates that the service life of these older state-built bridges is not materially reduced, and immediate hazard is not presented by present-day legal vehicles with occasional overloads. It is intended to point up the fact that present loadings on the bulk of the bridges on state highways are now encroaching into the danger zone, and that further encroachment is unsafe.

What would occur if present loadings were increased? A moderate increase would probably have little effect on the 20 percent of bridges constructed to the H 20-S16 standard. The same increase would substantially increase the annual cost of bridge replacement, due to increased damage to the 80 percent of bridges constructed for lighter loadings. The cost of replacing structurally deficient bridges on state highways in the 1953-54 Fiscal Year amounted to $4,230,000.

Snow Poles

Driving Them by Air Hammer Saves Time and Money

By M. E. FISCHER, District Maintenance Engineer

In the November-December, 1952, issue of *California Highways and Public Works* there appeared an article written by W. L. Savage, then Assistant District Maintenance Engineer of District IX, entitled "Life Line," which dealt with the task of driving steel snow spoles along U. S. 395 in Mono County.

This article reports on a recent experiment conducted in District IX whereby the former method of driving poles by hand will be discontinued.

It is estimated that 150 miles of state highway in District IX are lined with 10-foot steel snow poles and a grand total of some 9,000 poles were driven by hand, and had to be completed all within a period of about three weeks. Such antiquated hand methods of driving and a review of accidents which had occurred, instilled in the writer's mind the idea of using a suitable air hammer to do the job.

Method of Operation

Marvin Tetrick, Safety Supervisor, was placed in charge of the project and through his perseverance and efforts, together with the cooperation of the maintenance forces and Shop 9, this project has now been sufficiently tested to draw definite conclusions.

In 1953, a pilot model driving platform was constructed of wood. This platform rests on the sidewalls of the dump body of a two-ton truck and is clamped in place to prevent any accident from occurring from slippage or overturning. The platform is provided with railings all around, a feature which interfered with hand driving.

To complete the pilot setup, a pipe boom was attached to one corner of the platform along one of the corner posts. This boom was set in pipe sleeves giving freedom for rotation and easy removal. Necessary blocks were attached to the end of the boom and the air hammer was suspended by a three part line.

PHOTO 1

Equipment Used

The following equipment was used:

1. One 2-ton maintenance truck.
2. One 210-cubic-foot air compressor.
3. One Ingersoll Rand JB[4] air hammer, later replaced by one Thor-Cochise Model 25 pavement breaker.
4. The platforms with block and tackle.
5. A specially constructed driving head.

Driving tests were conducted in some of the hardest shoulder material known to exist along the highway where as long as 15 minutes' driving time by hand have been required. Time observations made showed that, assuming a steady rate of progress for seven hours, approximately 250 poles should be driven in one day by a three-man crew. Such production cannot possibly be maintained at 6,000- to 8,000-foot altitudes and from actual experience, 150 poles driven per day was considered tops for a normal driving crew of three men, including the truck driver.

When the air hammer was used, under the same conditions, our observations showed that at least 400 poles should be driven by the same crew.

Pilot Model Revised

Based upon the data obtained in the tests, a Thor Model 25 S pavement breaker with sheet pile driving head attached and weighing approximately 155 pounds, was purchased by the Equipment Department. The pilot model was revised in that steel swinging leads were constructed using 3-inch by 4-pound channels, and guides were placed on the hammer to fit the inside of the channels. An old crane with hand winch and cable was found at one of the maintenance stations. The complete driving setup is shown in *Photo No. 1.* A hinged clamping device with lugs to fit the shape of the pole holds the steel pole in place and the sheeting head on the hammer holds the pole in position at the top. *Photo No. 2* shows the clamp about to be closed and locked by a latch. *Photo No. 3* shows a pole under actual driving conditions. The man on the platform controls the winch with his left hand and operates the air valve with his right hand. The pole is driven approximately 18 inches and plumbing is automatic through the swivel connection at the top of the leads.

The hammer did not arrive in time to use during 1953, but when it did, tests were made on two miles of road not yet driven by hand.

Production Increase

During 1954 all poles on US 395 from the Inyo-Mono county line to the Nevada state line were driven by air hammer.

PHOTO 2

PHOTO 3

Each foreman, with one man, spotted the poles ahead of the driving operation, using an express. This was necessary because of the foreman's familiarity with snow conditions. (The pole spacing is varied according to conditions peculiar to a section.) The driving crew, consisting of three men, two-ton truck and compressor, worked the entire length.

After making a few minor improvements from the experience gained from the tests of the previous year, such as shortening the leads and cutting the height of the platform 24 inches and adding a step for the ground man to ride on between poles, instead of driving 150 poles per day by hand, over 600 poles per day were averaged increasing the production rate more than four times, using approximately 50 man days' time instead of about 200 man-days.

In addition to an actual, tangible, monetary savings, there are other intangible savings.

1. Poles need not be pointed.
2. The driven end will not be damaged one bit. No burring on brand-new poles was noted.
3. Breakage during driving is eliminated.
4. The accident hazard of hitting another man or himself with the sledge hammer has been eliminated.
5. The physical effort has been all but eliminated.
6. The morale of the men has been increased, because their job has been made easier.
7. A valuable savings in manpower has been realized.

RIVER WITHOUT A MOUTH

The Mojave River, which runs along U. S. Highway 66, is a river without a mouth, says the National Automobile Club.

This strange river has its source in the springs and snow crevices of the San Bernardino Mountains and has no mouth since its waters are swallowed up in the sands of the desert.

COUNTIES SHARE FOREST RECEIPTS

A check amounting to \$2,537,323.59 was recently turned over to the State of California as its share in the cash revenues from the national forests in California, according to Clare Hendee, Regional Forester, California Region, Forest Service.

This payment represents 25 percent of the receipts from timber sales, grazing fees, land use, and other uses of the national forests for the fiscal year ended June 30, 1954. As provided by law, the states apportion the money thus received to the counties having national forest land within their boundaries. The law further provides that the money will be used for the benefit of public schools and roads. When a national forest lies within more than one state or county, the portion of the receipts distributed to each, is proportional to the national forest area therein. Thus, many counties share in the receipts of two or more of the 21 forests in California.

Riprap Job

Highway Engineers Fight Ocean in Ventura County

By GEORGE E. DICKEY, Resident Engineer

The Coast Highway (US 101), which borders the beaches between the City of Ventura and the Santa Barbara county line, is now being developed into a modern, four-lane divided highway. This is in striking contrast to the early road through this area which required narrow two-lane timber causeways to span the numerous small embayments that even encroached upon the Southern Pacific Railroad right of way on the land side of the highway.

When the improvement to the existing three-lane roadway was carried out some years ago, steel sheet piling and concrete sea walls were constructed to replace the wooden causeways and the ocean was pushed out to the now existing beach line. Now once again because of the great increase in traffic volume and the need for modernization of this route, the State Division of Highways has found it necessary to take issue with the Pacific Ocean and force the shore line still farther out to sea.

Project Cost $2,434,900

This portion of the Coast Highway in Ventura and Santa Barbara Counties now under construction between Punta Gorda and 300 feet westerly of the Santa Barbara county line, is 2.85 miles long. The contract was awarded June 16, 1954, to McCammon-Wunderlich Company, contractor, Palo Alto. It carries a contract allotment of $2,434,900. The estimated time of completion is November, 1955.

The work consists of constructing a four-lane, divided highway, similar to adjoining completed construction easterly and westerly, with adequate drainage facilities, supported on the ocean side by approximately two miles of heavy riprap shore protection. The pavement section is to be constructed of four inches of plant-mix surfacing on eight inches of cement-treated base material placed on new roadway embankment.

The imported borrow is being excavated from a 500-foot-high hill north-

D8 dozer excavating for toe rock

Limo 803 crane with 70-foot and 2-cubic-yard Esco orange-peel bucket with rock hooks placing rock backing in riprap section

erly of the Southern Pacific Railroad at the easterly end of the project. Approximately 800,000 cubic yards of material will be stripped from the face of the hill on a 1:1 slope. This is being conveyed under the railroad tracks and under the existing state highway through a 10-foot by 6-foot box culvert, by means of a 600-foot conveyor system and elevated to hoppers from which it is being distributed with bottom-dump Euclids.

Drainage Facilities

The drainage facilities are a series of various size reinforced concrete box culverts which extend oceanward out through the riprap sea wall and extend landward to connect with existing drainage structures under the Southern Pacific Railroad tracks. The outer 45 feet of the ends of the culverts are designed as cantilevers to prevent any cracking during the anticipated settling of the riprap. These sections will be cast in place. Because of the large volume of public traffic through the contract, and in order to keep the contractors' heavy equipment off the traveled way and thus secure added safety by reducing traffic hazards, the remaining portions of the culverts are being precast in 11-foot sections and will be set in place as the roadbed is being constructed.

The riprap shore protection comprises almost one-half of the total expenditures for this project and naturally presents the most complex construction problems that occur on this contract.

Heavy Riprap

About one mile of the heavy rock riprap is to be placed along a beach area which is out of the water during low tides and can be worked fairly easy during the lower high tides. The remaining portion of the riprap work consists of placing rock 135 feet out in front of the existing sea wall where the water is from three to seven feet deep during calm seas and even deeper during storm periods.

The riprap section is made up of a 6-foot-thick blanket of rock, each of which weighs from 3 tons to 15 tons, placed on a solid foundation and carried up to 12-foot elevation. The voids are filled with chinking rock and the rock blanket is backed up with a 3-foot blanket of graded gravel which in turn prevents the embankment material from washing through the voids in the large rock.

Larger rock weighing from 5 tons to 15 tons are used as toe rock which is the base or foundation for the entire riprap structure.

To place these heavy rock on a firm foundation it is possible to work in the areas subject to surf action only at

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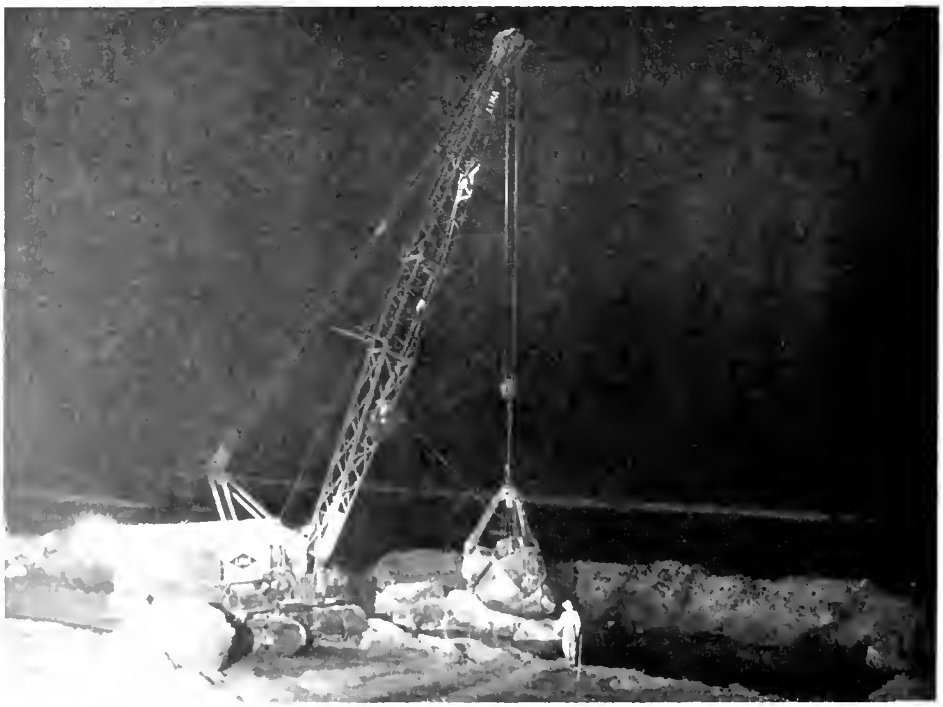
Looking oceanward showing Limo 803 crane placing 11-ton toe rock behind sand dike



Chico Project

Section of Realigned US 99E Open to Traffic

By P. C. SHERIDAN, Assistant District Engineer

THE RELOCATED portion of US 99E between Oroville Wye and Chico was officially opened to traffic on December 17th by a ribbon-cutting ceremony near the north end of the project at Chico. Chico Mayor, Ted Meriam, officially cut the ribbon and in a few brief remarks prior to the ribbon cutting, he expressed the appreciation of motorists in the region, noting that the new road is "important to this entire Northern California area."

Telegrams from Governor Goodwin Knight and State Director of Public Works Frank B. Durkee were read by Mayor Meriam. District Engineer A. M. Nash spoke briefly.

After the ribbon-cutting ceremony, the participants in the affair toured the entire length of the new route in a car caravan.

New Alignment

The nearly 19-mile length of new location traverses a route considerably removed from the old highway which involved several sharp turns on otherwise mostly tangent alignment, two main line crossings of the Southern Pacific Railroad, and went through the communities of Richvale, Nelson, and Durham. The new alignment reduced the travel distance by nearly a mile and also traverses somewhat higher ground, alleviating a bad drainage problem along the old highway. There are no communities along the new alignment to impede traffic flow.

Except at three locations, the new highway is a two-lane facility constructed on rights of way acquired for future development to expressway status. At the intersection of old Route 87, the Oroville-Chico lateral, a summit vertical has been constructed on a four-lane divided basis to decrease excavation and to provide better intersection channelization with Route 87.

Pavement Widened

At the Centerville Road intersection (Paradise Skyway) the pavement has also been widened to four lanes divided to provide better intersection facilities. Near the end of the project at the junction with the old highway, four lanes undivided have been provided to better channelize the intersection and to provide additional lanes at the crossing of the Sacramento Northern Railway. The four-lane undivided section then continues on into Chico to 20th Street, the end of the project.

Provision has been made in the location just south of Chico so that it will fit future routing adopted through the Chico area. Meantime, the portion between Centerville Road and the old highway will serve as a connecting link to the existing highway through Chico and will provide access to the future routing from the southern section of the city.

View of section of relocated portion of US 99E between Oroville Wye and Chico

Ribbon-cutting ceremony. Left to right: Capt. Ralph Walker, California Highway Patrol; Robert Pease, President, Chico Chamber of Commerce; Assemblyman Don Hobbie, Oroville; Harold W. Harrison, President, Paradise Chamber of Commerce; Robert Smith, Resident Engineer; A. M. Nash, District Highway Engineer; Supervisor L. Ray Black, Chico; Mayor Theodore Meriam, Chico; Don Montgomery, President, Butte County Chamber of Commerce; Supervisor Gene Stokes, Chico; Marshall Jones, Butte County Director of Public Works.

Thirteen Bridges

Actual work began with the letting of a $535,300 structure contract for the construction of 13 bridges on November 15, 1951. Twelve of the bridges are of the reinforced concrete flat slab type, and the bridge across Butte Creek is a reinforced concrete T-beam type of bridge. The structures constructed under this contract are listed as follows:

Junction Draw—2 spans 26 feet 2 inches long; roadway width 40 feet.

Western Canal—4 spans 30 feet 11 inches long, roadway width 28 feet.

Cottonwood Creek—3 spans 30 feet and 2 spans 22 feet 6 inches long; roadway width 28 feet.

Shppee Creek—2 spans 16 feet long; roadway width 40 feet.

Gold Run Creek—2 spans 13 feet long, roadway width 40 feet.

Dry Creek—1 span 36 feet and 4 spans 30 feet long, roadway width 28 feet.

Ash Creek—3 spans 30 feet long; roadway width 40 feet.

East Fork Roberts Creek—2 spans 34 feet and 2 spans 25 feet 6 inches long; roadway width 28 feet.

Roberts Creek—3 spans 30 feet long; roadway width 40 feet.

Scrub Creek—2 spans 10 feet 9 inches long; roadway width 40 feet.

Butte Creek—1 span 92 feet; 3 spans 59 feet and 1 span 50 feet long; roadway width 28 feet.

Edgar Slough-Upper Crossing—1 span 30 feet and 2 spans 22 feet 6 inches long; roadway width 40 feet.

Edgar Slough-Lower Crossing—2 spans 30 feet and 2 spans 22 feet 6 inches; roadway width 40 feet and a 5-foot sidewalk.

All but the last named bridge above are on the new alignment. Edgar Slough-Lower Crossing Bridge is on a realignment of a portion of the old highway constructed to provide a proper intersection facility with the new alignment.

H. W. Ruby was the contractor on this portion of the project and F. C. Marshall represented the Bridge Department for the State.

Grading Project Under Way

The next unit in the construction of the over-all project was a grading contract between 3.8 miles north of Oroville Wye and 20th Street in Chico. Work began on this unit on May 29, 1952. Included in the contract was the complete base and surfacing of the portion on old Route US 99. Major items on this $745,700 project included 471,244 cubic yards of roadway excavation; 9,360 cubic yards of structure excavation; 10,310,000 station yards of overhaul; 23,457 tons of untreated rock base and 913 cubic yards of structure concrete. The contractor was Richter Bros. of Oroville. D. R. Hislop and T. G. Smith were Resident Engineers for the State.

In order that a portion of the realignment might be put to use, the next unit of construction consisted of surfacing from the junction of Route 87 to old Route US 99 south of Chico. Completion of this third unit enabled the Oroville-Chico lateral traffic to use a portion of the new facility. Work began on this unit on June 11, 1953, and traffic was routed over this portion of the new alignment in May, 1954. Rice Bros. of Marysville was the

... Continued on page 58

Minarets Summit Road

FAS Route 1195 in Mono Is Improved

By HOWARD EMRICH, Road Commissioner of Mono County

Mono county completed another link of its Federal-aid Secondary System on October 29, 1954. By surfacing 5.5 miles of FAS 1195, a large recreational area was made more easily accessible.

The route known as the Minarets Summit Road begins at State Highway No. 112 (Mammoth Lakes Road) and extends to the Mono-Madera county line. From the Madera county line a dirt road continues to the headwaters of the San Joaquin River and the Devil Postpile National Monument.

Historical Background

Back in the 1870's when the gold mining town of Mammoth (then known as Pine City) was booming, the need for a road over Mammoth Mountain was realized. While miners were seeking their fortunes there and in Bodie, Aurora, Lundy and other thriving communities, to the north and east, still bolder prospectors were pushing farther back in the rugged peaks of the Sierra. Agnew Meadows, along the headwaters of the San Joaquin River, was headquarters for one such mining group. This, too, was a stopover for the pack trains that fought their way eastward over the mountains from Fresno Flats. From here they crossed Mammoth Mountain to bring supplies to the mining camps.

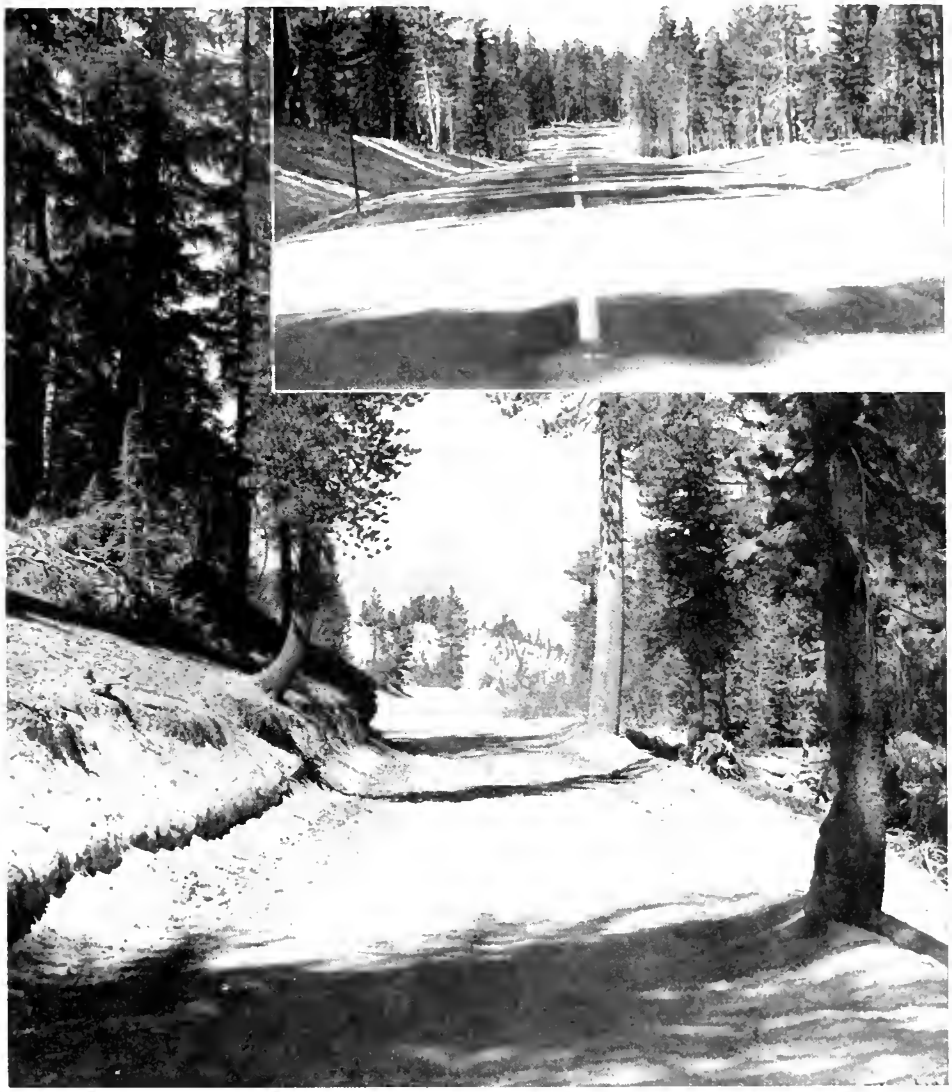
About 1929 the mining companies eventually built a road from Mammoth to the San Joaquin River at the mouth of Minarets Creek. This was later extended to Reds Meadows, near the Devil Postpile National Monument. It was somewhat improved and maintained by the U. S. Forest Service.

Recreational Route

The Minarets Summit Road today is primarily a recreational route. Until about 10 years ago this area was only opened to the enjoyment of the public for a few months each summer. Some years it was late July before the snow melted on the summit.

With the improvement of this section of road and the inauguration of a county snow-removal program, the tourist season has been extended considerably. Numerous resorts and businesses have come into the picture as a result of this increased season and the economy of the area has greatly improved.

In addition to the magnificent scenery, there are several outstanding points of interest for the tourist. About 1.8 miles from the Mammoth Road one crosses the earthquake fault. This fault, sometimes thought to be a cooling crack, can be followed intermittently for several miles across the country. In places the crevices are 20 to 30 feet deep and snow remains the year round.

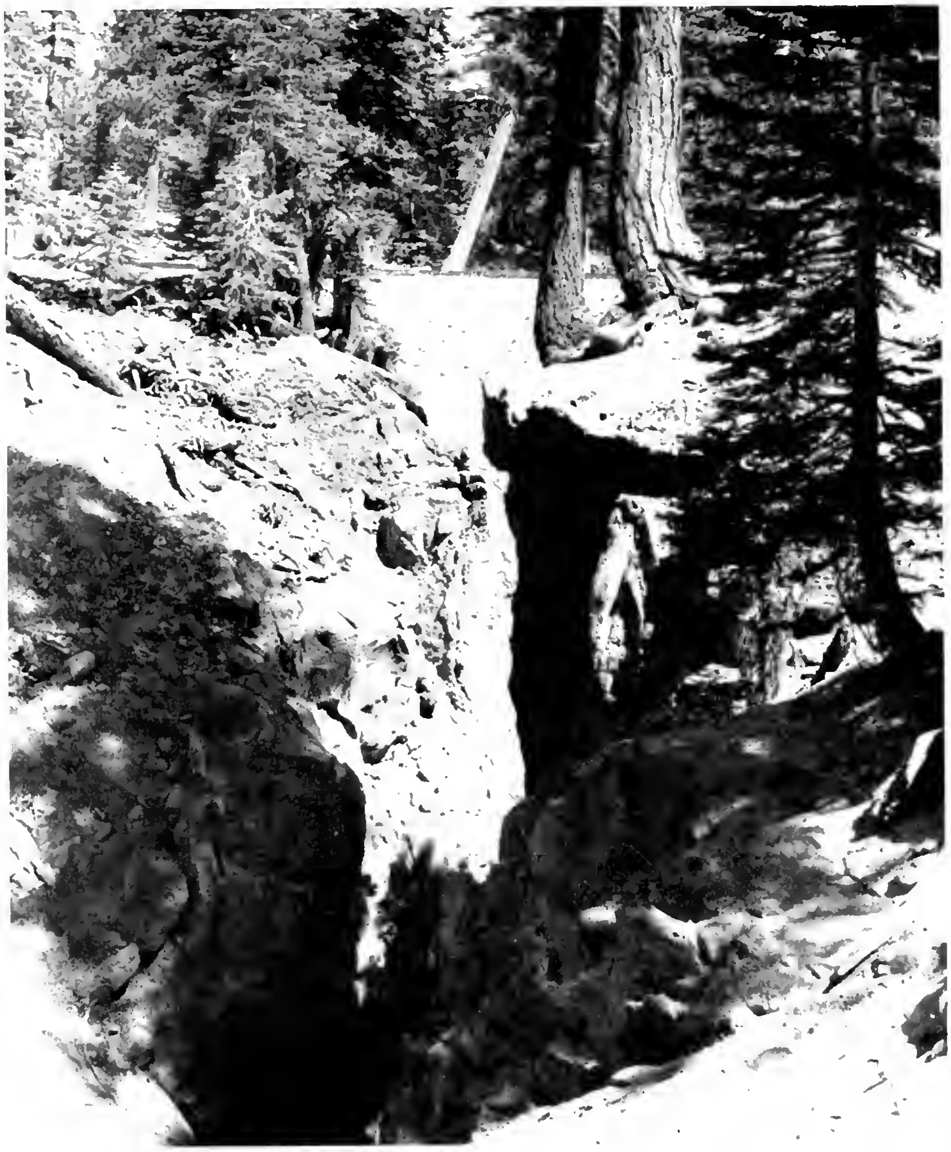


UPPER—A view of the completed Minarets Summit Road after surfacing under Mono County's FAS program. LOWER—A typical section of Old Minarets Summit Road before reconstruction by Mono County.

From its meager beginning when the customers were towed behind a secondhand army weasel to the ski tows, there has developed, on the slopes of Mammoth Mountain, one of the best-known ski areas in California. Here as many as 1,500 persons a day have ridden the tows to a height of over 10,000 feet and a brave few climb to the summit to see the world from a dizzy elevation of 11,035 feet. This area boasts one of the longest skiing seasons in California, from November to June or July, and is reached by this newly constructed highway.

At the Madera county line, some 9,100 feet above sea level, the Forest Service maintains an observation point where the public may enjoy the beauty of the Sierra. Such points of interest as the Devil Postpile National Monument, the San Joaquin River with its colorful Rainbow Falls, Mammoth Mountain, the Minarets, and Reds Meadows may be observed from this station. From here one descends to the valley of the headwaters of the San Joaquin, a paradise for fishermen and hunters, where the Forest Service maintains camp grounds along the river and a well-stocked pack station is provided for the more rugged sportsman.

At the end of the road the tourist may park his car and after a short hike arrive at the Devil Postpile National Monument. This freak of nature was caused by the cooling and shrinking of a flow of an igneous mass of basalt. As the formation was exposed to erosion, the columns toppled to form a jumbled mass of rock.



Earthquake fault crossed by Minarets Summit Road, Federal Aid Secondary Route 1195 in Mono County

This view of the parking area near Mammoth Mountain on the Minarets Summit Road indicates the importance of this newly completed FAS route to skiing enthusiasts

Recent Improvements

The original road when it was taken into the Mono County Road System in 1948 was little more than a good-sized stock trail. From its beginning it twisted around and turned, climbed and dropped for approximately seven weary miles. In many places the road was not much more than eight feet wide. Grades of 12 percent and a radius of 50 feet were not uncommon.

In the spring it was difficult to find the road, much less remove the snow from it.

To better this condition, the Mono County Road Department in the spring of 1950 started a survey for a complete realignment of this section. By September, 1951, with its own forces, it had completed 5.5 miles of new alignment. A 24-foot gravel roadbed was used with a minimum radius of 250 feet and a maximum grade of 6 percent for the greatest part of the construction.

In the spring of 1954, the construction forces of the Mono County Road Department widened the existing roadbed to 28 feet, increased the sight distances and decreased the grade in a number of places.

The work as let under contract consisted in general of priming the already completed roadbed and the placing of a road-mixed surfacing. The new construction provided for a 20-foot paved section of 0.21-inch thickness.

The contractor for this project was Burnett & Smith Construction Co., of Los Angeles, California. The total cost of the contract was $57,-870.10 exclusive of engineering. The project was financed with Federal-aid Secondary Funds, State Highway Matching Funds and County Funds.

Construction engineering forces used on this project were employees of the California Division of Highways, District IX, at Bishop. Fred E. Thompson was resident engineer.

SAFETY AWARDS

Southern California Freight Lines of Los Angeles has announced names of its drivers who have won the National Safety Council Safe Driver Award. This award is generally conceded to be the Nation's highest award for professional safe driving of commercial vehicles. To qualify, a driver must complete 12 consecutive months without being involved in an accident.

The company states that 67 percent of all of its drivers eligible to earn the award were successful in doing so. A total of 268 awards were earned this year. The awards ranged from 1 to 17 years.

SACRAMENTO-LODI UNIT LAUNCHED BY GOVERNOR

Governor Goodwin J. Knight operates bulldozer to break ground for first unit of Sacramento-Lodi Freeway while Director of Public Works Frank B. Durkee happily participates in ceremony

Governor Goodwin J. Knight officiated at the beginning of actual construction of the first phase of the program to improve U. S. Highway 99 to freeway standards, between Sacramento and Lodi, when he manipulated a huge bulldozer into forward gear and made the earth fly at a ceremony at the junction of Highway 99 and Elk Grove Road, on December 21st. Following brief talks by Clyde A. Shurtleff and John Bronson of the Sacramento Chamber of Commerce, A. M. Nash, District Highway Engineer in charge of the project and Frank B. Durkee, State Director of Public Works, the Governor was introduced by H. Stephen Chase, Highway Commissioner from Sacramento.

Governor Knight expressed his determination to bring the State Highway System up to adequate standards with all possible haste and stated that he was particularly pleased with the start of work on this section of highway, in keeping with assurances given to the people in the area that action was forthcoming. Mrs. Knight was introduced and told of her interest in better highways and of her pleasure in participating in this first experience in ground-breaking ceremonies.

Contract for the project in the sum of $1,513,047 was awarded to Granite Construction Co.

The second phase in the program to four-lane Highway 99 on freeway standards will be on the section between Jahant Corners and the Sacramento county line. Bids for this work were opened January 19th, and the low proposal, $1,036,230, was submitted by M. J. B. Construction Co. and Lord and Bishop, Stockton. On January 27th, the contract for this project was awarded to the low bidder by the Department of Public Works.

Safer Highways

Study Shows Roles of Enforcement and Freeway Construction

By J. W. VICKREY, Assistant State Highway Engineer, and
R. J. ISRAEL, Assistant Traffic Engineer

The crusade against loss of life, limb, and property on the highway is unending. It is carried on continuously by those who refuse to accept an annual nation-wide toll of 38,000 deaths, 1,350,000 injuries and more than 4 billion dollars in accident costs as the necessary price of a motorized civilization.

The crusaders work through the newspapers, the classroom, the driver licensing bureaus, research laboratories, national and community organizations, insurance companies, and the automotive and other industries. They include in particular the enforcement officers who patrol the highways and the engineers who design and build them. Increasingly, these people make their contributions to safety as a team, recognizing that the causes of highway accidents are deep-seated and complex.

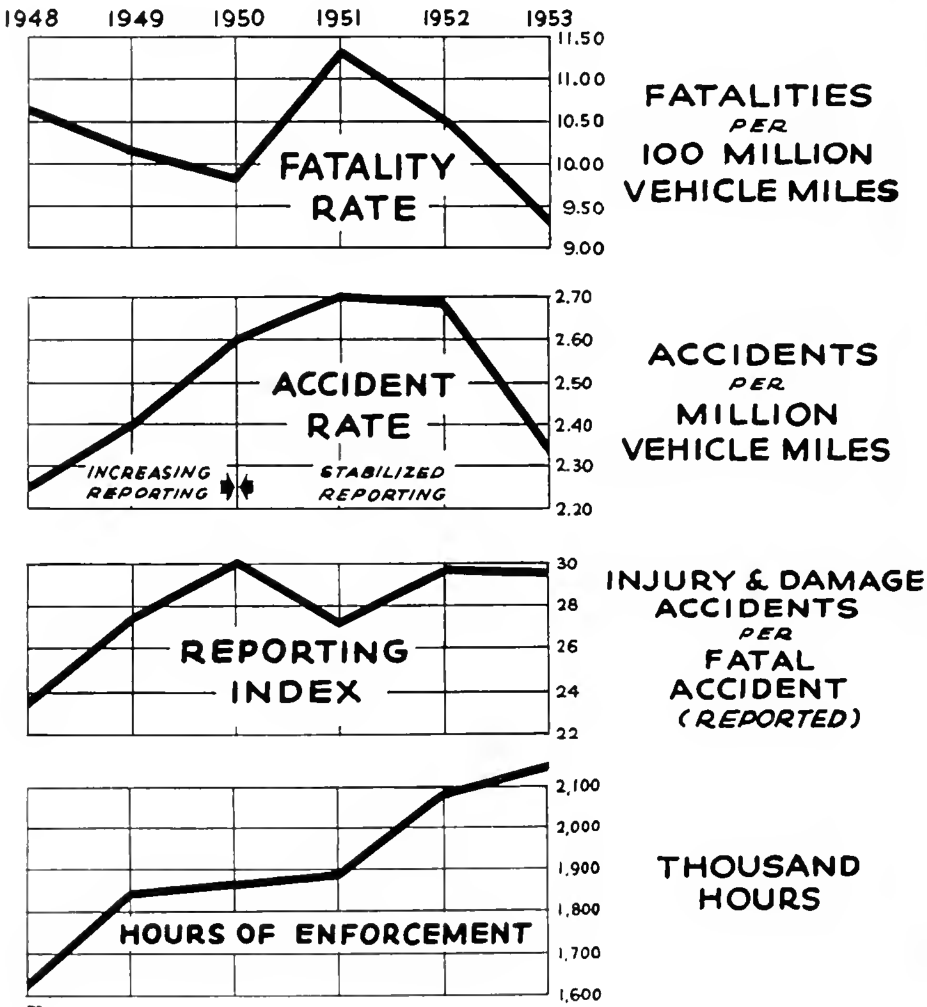


Fig 1

Goal Is Less Accidents

Measurement of the achievements resulting from these continuing efforts is in terms of the accidents that don't happen. A substantial reduction in the *number* of fatal and other accidents is the immediate goal, although this becomes more difficult year by year as traffic continues to increase. Safety advocates can with considerable justification claim some degree of success if the *rate* of accidents per mile of travel goes down even though the *number* of accidents goes up due to increased numbers of vehicles in operation. But the engineers, the enforcement officers, and other safety workers are primarily interested in preventing accidents and in saving lives, not in statistics.

California has had a definite decrease in the accident rate on its rural state highways since 1951 (*see Figure 1*), and an actual decrease in the *number* of fatalities state-wide from 3,562 in 1952, to 3,371 in 1953, and 3,087 (preliminary figure) for 1954. If this trend can be continued, it is evident that the safety crusade is making some progress—although one traffic death in California on the average of every 170 minutes is nothing to be complacent about. There is no lack of incentive or challenge to greater efforts on the part of everyone concerned with highway safety.

Available Yardsticks

To what extent can the various factors contributing to improved highway safety be segregated and measured? Obviously, the beneficial effects of driver education are most difficult to analyze, although experts agree that the attitude of the individual driver is the keystone of any sustained safety effort.

Enforcement and engineering measures, on the other hand, do lend themselves to some degree of measurement. This study is an attempt to bring together and correlate data which have been collected for the most part in California but also in some eastern areas. Analysis of these data has led to the following general conclusions:

1. There is evidence that increased enforcement can exert a favorable influence on the accident and fatality rates.

2. The amount of increased enforcement manpower required to effect a decrease in accidents and fatalities appears to be large in proportion to the results obtained.

3. The effect of increased enforcement on accident and fatality rates tends to diminish as further enforcement manpower is added.

4. Freeways not only move large volumes of traffic expeditiously, but also with greatly increased safety.

5. Freeways exert a beneficial safety effect on nearby roads and streets. Accident rates have been materially reduced on a city-wide basis after the opening of a freeway through or around moderate-sized California cities, and have been reduced to some extent in metropolitan areas as a reflection of an expanding freeway network.

6. Freeways, particularly in metropolitan areas, are self-liquidating in that they repay their total cost in savings to the motorist in a few years.

Enforcement in California

Figure 1 shows the accident and fatality rates on the California Rural State Highway System for the years 1948 to 1953 compared to the annual enforcement hours and the reporting index for these years.

Accident and fatality rates are from the California Division of Highways records. Enforcement hours are from the reports of enforcement activities issued by the California Department of Highway Patrol. The reporting index is a standard computation based on actual motor vehicle accident reports received, which compares the reported number of injury and property damage accidents to the reported fatal accidents.

It may be noted that the reporting index closely parallels the accident rate for the years 1948 to 1950, which indicates that increased reporting is primarily responsible for the increased accident rate during this period. The reporting index has been generally stabilized since 1950, thus the accident curve can be considered basically sound from 1950 through 1953.

Fatality Curve

Fatalities, since they have always been naturally subject to complete reporting, probably form a better basis for comparison than accidents in general. The fatality curve is generally downward since 1948, except for the high peak in 1951. In that year of war in Korea, there was an increase in traffic deaths throughout the United States, generally traced by recognized safety authorities to the increased tensions and recklessness characteristic of wartime. In California, which served as a major base for armed forces activity, it is not surprising that a disproportionately large share of the fatality reports contain the names of military personnel.

Compilation of the fatality rate on the Rural State Highway System has not yet been completed for 1954, but preliminary figures indicate a substantial drop which will extend the downward curve on the chart still farther.

In connection with *Figure 1*, it should be emphasized that the period between 1948 and 1953 was also a period of extensive highway improvements. These improvements ranged from specialized treatment of individual high accident intersections to major freeway construction, and must be considered as going hand in hand with increased enforcement. More detailed discussion of the evidence of effects of highway construction on the accident rate in California will be found later in this report.

Rural Traffic Increase

During the period covered, there was an increase of traffic on the Rural State Highway System from 11,235 million vehicle miles in 1948 to 15,884 million vehicle miles in 1953. Traffic on the Rural State Highway System may be considered indicative of and parallel to increases on all rural roads in California.

Increased traffic volume without increased road mileage does not appear to have much effect upon enforcement requirements. Pennsylvania Turnpike figures, which appear later in this report, show that accident and fatality rates have dropped materially in spite of the fact that increased traffic volumes far exceed increases in police activity. Traffic increases may bring minor roads into a classification where increased patrol activity is required, and it is recognized that divided highways may add to the enforcement problems where opportunities for an officer to cross from one road to the other are spaced far apart. However, increased volumes on a set mileage appear to add little to the enforcement load.

What effect has the increase in enforcement in California, as shown in *Figure 1*, had on the behavior of drivers? Has the reduced accident rate been attributable to fewer violations of the rules of the road? The unexpected answer, as provided by an analysis of the accident reports of the California Highway Patrol, is that violations and driver condition are factors in an increasing percentage of accidents.

Factor of Drinking

Table 1 is a tabulation showing, for the California Rural State Highway System, the percent of accidents in which driver conditions, improper speed, and other violations are involved. This information was previously obtained for the years 1948, 1949, and 1950. Data were extracted for the last two years, 1952 and 1953, as a check against the earlier data. The five separate years, which span a six-year period, are shown for each major classification.

This table shows that the percent of total accidents involving had-been-drinking drivers is the same for 1948 and for 1953, although in fatal and in injury accidents drinking has increased as a factor.

The percent of accidents involving improper speed has increased substantially since 1948, although 1953 shows a drop from the high point of 1952. The percent of total accidents involving other violations has increased very slightly, while the total percent of accidents in which driver condition, speeding, or other violations are involved, shows a substantial increase.

Pennsylvania Turnpike

Accident and fatality records for 1950 to 1953, inclusive, for the Pennsylvania Turnpike, together with miles, million vehicle miles, and rate of enforcement are shown in *Table 2*.

TABLE 1—STATE OF CALIFORNIA RURAL HIGHWAY SYSTEM

PERCENT OF ACCIDENTS IN WHICH DRIVER CONDITION, IMPROPER SPEED, AND OTHER VIOLATIONS ARE INVOLVED

	Percent total accidents by years					Percent fatal accidents by years					Percent injury accidents by years				
	48	49	50	52	53	48	49	50	52	53	48	49	50	52	53
Had been drinking	22.0	21.8	21.4	22.3	22.0	22.4	21.4	21.4	23.6	24.0	24.2	24.9	24.9	26.4	26.3
Other driver conditions	7.7	7.8	7 5	3.6	4.5	10.0	11.1	8.8	6.2	8.6	8.8	9.9	9.1	4.7	5.8
Total driver conditions	29.7	29.6	28.9	25.9	26.5	32.4	32.5	30.2	29.8	32.6	33.0	34.8	34.0	31.1	32.1
Improper speed	13.1	23.8	28.4	40.6	30.8	14.7	32.0	22.0	42.3	32.1	13.8	26.4	31.6	45.0	33.7
Violation of rules of the road	70.2	72.0	73.1	74.0	73.3	49.1	48.3	48.5	52.4	51.0	63.2	63.7	65.8	67.2	66.4
Total number of accidents in which violation or driver condition is involved	82.7	86.0	87.5	90.3	88.4	69.1	75.3	74.0	80.2	80.5	79.4	83.4	85.6	90.0	88.0

This information was furnished by the Pennsylvania Turnpike Commission. The number of patrols were not shown for 1950, but the table shows that miles per patrol decreased substantially in 1952 as compared to 1951 and then increased slightly in 1953.

Regardless of variations in enforcement, accident rates and injury accident rates decreased substantially and uniformly over the four-year period. The fatality rate decreased sharply to 1952 and leveled off at that point, showing a closer relation to enforcement.

Another factor which might be of influence, although not apparent in this table, is the establishment of reduced speed limits on the western half of the turnpike on January 15, 1953. The basic speed limit was reduced from 70 to 60 miles per hour for passenger cars, from 60 and 50 miles per hour for light and heavy trucks to 45 miles per hour for all trucks, in addition to special 45-mile-per-hour limits at major bridges and 35 miles per hour at tunnel portals.

Chicago Study

A report "Effect of Enforcement on Vehicle Speeds" by James Stannard Baker, Director of Research, Northwestern University, is printed in Highway Research Bulletin No. 91. This is a report made by the Traffic Institute at Northwestern University in cooperation with the Bureau of Public Roads to study (1) the effect of a patrol unit on nearby vehicles, and (2) the effect of increased enforcement on vehicle speeds in Chicago. Speed studies were made at the same locations one year before (1948) and the first and third years after the increased enforcement.

Figure 2 shows the relation between increased speed arrests, reduced average excess speed, and reduced death rates in the City of Chicago. The average excess speed, as used in this report, is defined as the sum of the amount by which each vehicle exceeds the speed limit divided by the total number of vehicles. This figure shows that speed arrests (which remained a fairly constant percentage of arrests for all hazardous traffic violations) were more than doubled initially during the "after" period. The resulting excess speed was reduced 35 percent. The death rate per 10,000 registered vehicles was reduced approximately 17 percent by the end of the study.

Day and Night Speeds

Figure 3 shows the effect on day and night speeds of this increased enforcement, and shows that night speeds reflected increased enforcement substantially more than day speeds. The report points out:

"With the increase in enforcement, there was a conspicuous, but not specifically recorded, improvement in selectivity of enforcement, which increased the amount of night enforcement more than the day enforcement. How important this effect is we do

TABLE 2—PENNSYLVANIA TURNPIKE

ACCIDENT DATA, 1950 THROUGH 1953

Year	Average number of patrols	Miles	Miles patrol	MVM	Acc.	Acc. MVM	F. and inj. acc.	F. and inj. acc./MVM	Fatalities	F/100 MVM
1950		160-9 mo. 260-3 mo.		476 0	949	1.99	380	0.80	59	12.4
1951	33.3	260	7.8	774 2	1,409	1.82	549	0.71	66	8.5
1952	49.7	260	5.2	1,141.8	1,832	1.60	685	0.60	83	7.3
1953	60 7	327	5 4	1,206 2	1,639	1.36	589	0.49	91	7.5

MVM = Million vehicle miles.
F. and Inj. Acc. = Fatal and injury accidents.
F/100 MVM = Fatalities per 100 million vehicle miles.

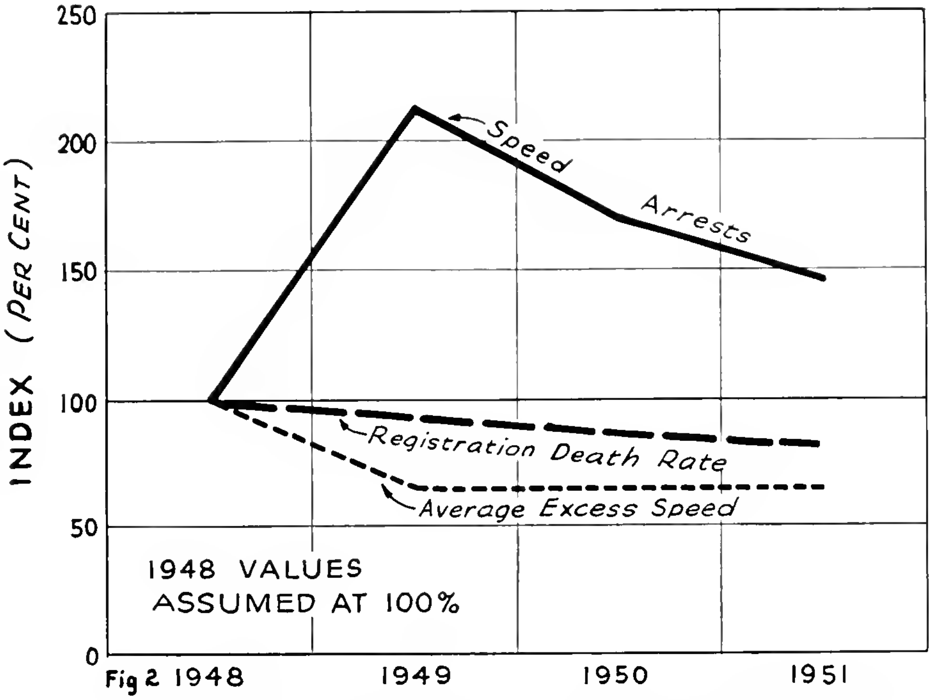


Fig 2

CHICAGO STUDY—EFFECT OF ENFORCEMENT ON VEHICLE SPEEDS

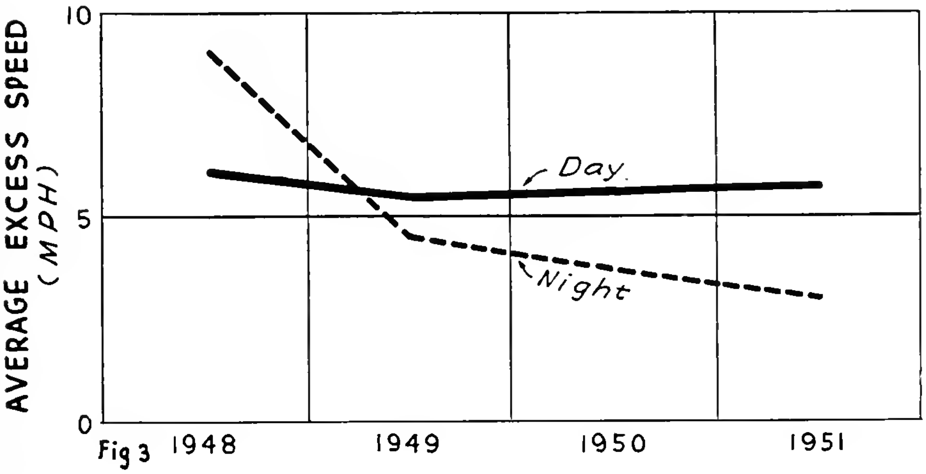


Fig 3

not know. The apparent effect on speed seemed to have no comparable effect on accidents by night and day. The percentage of total fatal accidents between 8 p.m. and 6 a.m. was 46 in 1948 and 47, 44, and 42, respectively, in the three following years."

Thus, with more than doubled arrests at the outset, a lesser but noticeable improvement was made in the city-wide fatality rate. The fact that selective (night and day) enforcement did not achieve significant results leads one to believe that other factors may have been responsible in considerable measure for the reduced fatality rate in the City of Chicago.

In a letter commenting further on his study, Mr. Baker states: "We would not be justified in assuming that corresponding increases in enforcement would achieve similar reductions in accidents in other places than Chicago. Chicago had a substantially higher death rate than other cities in its population group to begin with, and I believe we are safe in saying that it is easier to make an improvement in a bad record than in a normal record."

New Jersey Turnpike

Data received from the New Jersey Turnpike Authority shows the cumulative fatality rate as compared to turnpike police detachment (number of officers), (*see Figure 4*). They show that enforcement has been increased at various intervals and the fatality rate is being continually improved.

In addition to increased manpower, this turnpike authority is spending large sums to increase safety. One addition was the installation of large, neon-lighted signs, placed at intervals of approximately five miles in the northern portion of the turnpike where traffic conditions are dense, to inform motorists of fog, ice, snow, or other emergency conditions ahead. These signs carry a large message reading "Drive Slow" which flashes on and off to attract attention and mentions the specific condition.

The turnpike authority states: "Our present detachment strength of 76 officers and men yields a continuous patrol force of 12 to 14 cars over 118 miles of turnpike. We also have two three-man radar teams which are not usually engaged in patrol activity. However, during critical periods of heavily traveled week ends and holidays, these men are assigned to patrol car duty to supplement the usual patrol strength."

The surprising situation here is that with from 76 to 82 officers to cover 118 miles on this most modern facility, by far a higher concentration of officers per mile of road than any other known facility, the New Jersey Turnpike has yet to achieve the low fatality rate of the average of full freeways on the California State Highway System.

California—Special Enforcement

Up to now this study has dealt with enforcement on a continuing or permanent basis. Although that is the major factor to be considered, some examination should be made of the effects of special or "spot" enforcement, particularly as carried out by special units of officers, often referred to by the press as "flying squadrons."

Table 3, obtained from the records of the California Highway Patrol, shows what happened in eight areas of California where special enforce-

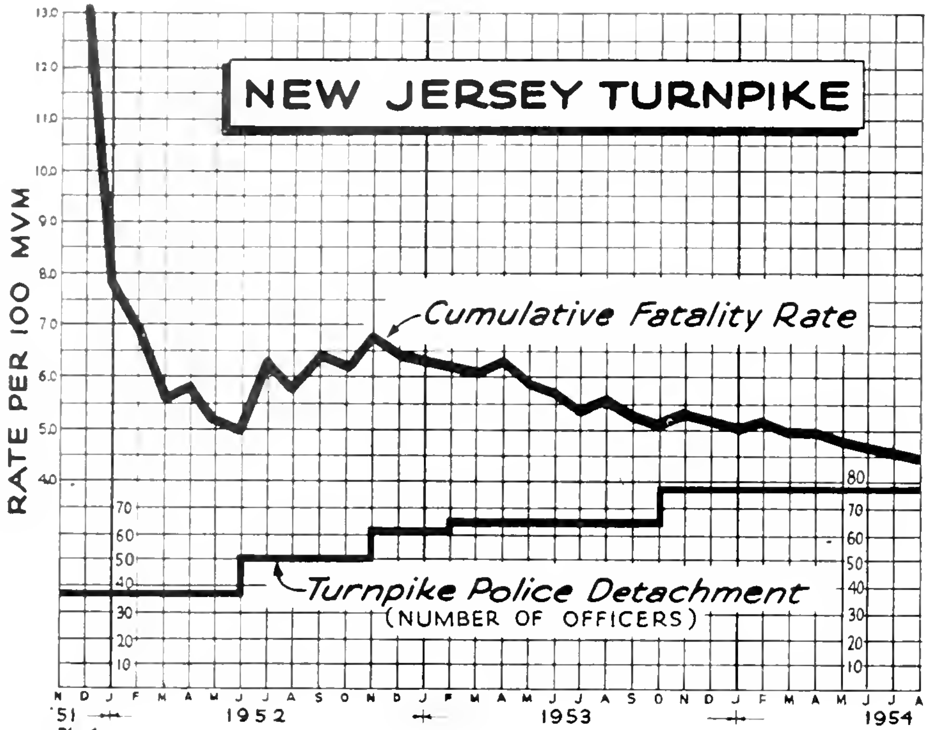


Fig 4

ment units operated for a short period of time. Comparison of hours of enforcement and of accidents is made for a corresponding month one year earlier when normal enforcement activity was under way in the area.

At first glance it might appear that this type of operation could isolate the effects of enforcement alone. It should be noted, however, that special enforcement activities in a particular locality are heralded in advance by considerable publicity emanating originally from the California Highway Patrol itself and followed up by the local newspapers throughout the campaign. There is no doubt that this publicity is an important factor in the effectiveness of such special enforcement on the accident rate, a factor which does not apply to everyday enforcement efforts.

In this connection, those special enforcement locations at which increases in enforcement manpower were small showed the greatest proportionate reduction in accidents. For example, in the Redwood City area a 7 percent increase in enforcement hours produced a 10 percent decrease in accidents. At the other end of the scale, the Bakersfield location, with a 77 percent increase in enforcement manpower, achieved only a 28 percent reduction in accidents.

Highway Improvement

Beginning with the Collier-Burns Highway Act in 1947, California has carried on an accelerated program of state highway construction and traffic improvement, which has been an important factor in reducing the accident and fatality rates, as shown in *Figure 1*.

Table 4 shows the mileage of two-lane, multilane, and multilane divided highways on which construction work was done between July 1, 1947, and June 30, 1953.

The figures on two-lane roads include those on the Federal Aid Secondary System, and cover not only miles of highway constructed on new and improved alignment but also such improvements as resurfacing or widening.

The multilane and multilane divided columns, however, show actual net miles of constructed facilities on the California State Highway System, rural and urban. Specifically, on the Rural State Highway System during the period of this study, in addition to improvements on two-lane roads, our actual status mileage has been increased by 403 miles of four-or-more-lane divided expressways or freeways, which roads have low accident rates. At the same time, status mileage has been *decreased* by 153 miles on high accident type roads, primarily three-lane highways, and two-lane mileage reduced by 331 miles.

TABLE 3—CALIFORNIA HIGHWAY PATROL
SPECIAL ENFORCEMENT UNIT ACTIVITIES—COMPARATIVE DATA

Area	Month and year compared	Without special enforcement unit		With special enforcement unit		Percent inc. patrol hours	Percent reduction, accidents
		Patrol hours	Accidents	Patrol hours	Accidents		
Bakersfield	Jan., 1953-Jan., 1954	4,705	232	8,376	167	77	28
San Leandro	Nov., 1952-Nov., 1953	3,032	227	3,384	189	12	17
Sacramento	Mar., 1953-Mar., 1954	5,228	214	8,543	142	62	33
Stockton	Apr., 1953-Apr., 1954	3,387	157	4,591	143	36	9
Redwood City	July, 1952-July, 1953	2,808	135	3,001	121	7	10
San Bernardino	July, 1952-July, 1953	3,851	204	4,507	191	17	6
San Diego	Mar., 1953-Mar., 1954	4,641	213	5,261	193	14	9
East Los Angeles	Oct., 1952-Oct., 1953	3,237	311	4,013	217	24	30
Totals		30,889	1,693	41,676	1,363	35	19

TABLE 4—CONSTRUCTION BY STATE DIVISION OF HIGHWAYS
1948 TO 1953, INCLUSIVE

Year	Construction on State and FAS Highways	Constructed miles on State Highways Rural and Urban	
	Two-lane	Multilane	Multilane divided
1947-1948	600.6	18.3	105.8
1948-1949	689.6	40.8	106.8
1949-1950	548.8	56.5	151.0
1950-1951	495.1	16.9	114.8
1951-1952	574.6	11.6	99.1
1952-1953	564.9	1.6	105.6

In addition to these major improvements, there are thousands of locations on the State Highway System where special steps have been taken to alleviate a high accident situation.

Accident Patterns

These are the locations where the California Highway Patrol, through reports of accident investigations, has enabled the Division of Highways to determine the locations and patterns of recurring accidents. Analysis of these Highway Patrol reports, supplemented by engineering field studies, has led to reconstruction or minor relocation, channelization of intersections, or increasing of sight distance. Improvements of this type have been made at an average of 332 locations a year since 1948. Nor does that figure include the hundreds of other locations where the addition of signs, striping, reflectors, and other devices have corrected or alleviated a condition which had been contributing to accidents.

Some of these simple methods of location treatment may be spectacularly effective. At one location the Division of Highways was enabled through county cooperation to prohibit left turns off a heavily traveled highway onto a county road. During the year before the "no left turn" sign was installed there had been 46 accidents at the intersection. During the year following the installation the accidents totaled four.

Effect of Freeways

The effect of freeway construction on the accident picture is definite and immediate, and particularly gratifying in that it produces an especially marked reduction in fatalities.

Since the first freeway was completed in California before World War II, both the over-all accident rate on full freeways and the injury accident rate have consistently been approximately one-half the rate for conventional rural state highways. The *fatality* rate has been from *one-fifth* to *one-fourth* the rate on conventional rural highways. The comparison with rural highways is the most appropriate since full freeways even in the congested metropolitan areas operate on the basis of the rural speed limit of 55 miles per hour.

Freeways are planned and constructed to save time, money and lives by carrying large volumes of traffic safely and expeditiously. Because of the elimination of cross traffic, freeways can and do carry far more vehicles per lane than any other type of highway facility. The design of freeways is constantly being improved on the basis of experience under actual traffic conditions. For example, the Pasadena (Arroyo Seco) Freeway, which was opened to traffic in 1940, was an example of pioneering in the freeway field. Some of its features are today considered substandard, and have been modified in the design of subsequent freeways. Nevertheless, the original section of the Pasadena Freeway is now carrying traffic volumes exceeding 50,000 vehicles per day, and its safety record compares favorably with other freeways in California.

Table 5 shows 1953 traffic and five-year accident, injury-accident and fatality rates for the various types of rural highways compared to the composite 12-year record on full freeways, rural and urban.

In addition to the increased safety to the vehicles traveling on the specific facility, the construction of a full freeway generally has a far broader influence on accident rates. That is, when a freeway removes the impatient and higher-speed traffic from the main street of a community, a very material reduction in accidents is noted not only for the freeway traffic but also for the traffic which remains on the city street. Actually, a freeway bypass on the one main route which traverses a moderate-sized community can effect a material accident reduction on a city-wide basis.

TABLE 5—TRAFFIC AND ACCIDENT DATA ON RURAL STATE HIGHWAYS

Number of lanes	1953 Data		Five-year average rates (1949-1953)		
	Miles	Average daily traffic	Accidents per MVM*	Fatal and nonfatal accidents per MVM	Fatalities per 100 MVM*
2	10,881	2,393	2.34	1.07	(10.63)
3	149	12,952	2.90	1.21	(12.65)
4 undivided	179	22,188	3.72	1.43	(8.15)
4 divided	247	16,297	3.16	1.24	(9.06)
4 divided expressways	567	11,559	2.05	0.92	(10.21)
Totals (incl. misc.)	12,543	3,469	2.56	1.11	(10.27)
Full freeways (Rural and urban)	82	47,017	†1.41	†0.61	†(2.26)

* Million vehicle miles.
† Total record = 1941-1953.

Carlsbad-Oceanside Freeway

One example of this city-wide effect has occurred in the area of Carlsbad and Oceanside following the opening of a 10-mile freeway on November 16, 1953. As evidence of this effect, reports by responsible agencies in Oceanside are shown below as they appeared in the Oceanside *Daily Blade-Tribune* and the San Diego *Union*.

(Quoted from February 26, 1954, edition of Oceanside *Daily Blade-Tribune*):

"That the Oceanside-Carlsbad Freeway has been a major contribution to traffic safety was dramatically illustrated today by statistics released to the Oceanside Chamber of Commerce by the local hospital.

"For the 90-day period prior to the freeway opening November 16th, there were 23 ambulance traffic cases handled by the hospital. Most of these cases from August 16th to November 16th, the hospital informed Chamber Manager Zac Dunlap, involved major injuries and confinement periods extending into weeks and months.

"From the freeway opening to February 16th, however, there were only 12 traffic ambulance cases—barely over half of the prefreeway rate. Of the 12, all injuries were minor in nature and required only short periods of confinement.

"The Oceanside Hospital usually receives traffic victim cases from San Clemente to Leucadia.

"In commenting on the figures released by Wilma Taylor of the hospital, Dunlap declared:

" 'The freeway's saving in human life and suffering has already become evident in a brief, 90-day period.

" 'This should be especially noted by local residents because the life which was saved or the injury which didn't happen could well have been theirs or their loved ones.' "

(Quoted from March 1, 1954, edition of Oceanside *Daily Blade-Tribune*):

"Freeways are safe ways to travel, indeed.

"Oceanside's city accident ratio which had been steadily climbing in recent years has taken a sharp dip since the opening of the O-C (Oceanside-Carlsbad) Freeway, according to figures released today by Sgt. Cliff Haver of the local police department.

"The city decline substantiated the Oceanside Hospital report (in Friday's *Blade-Tribune*) which showed a slightly less than 50 percent drop in ambulance cases during the three months since the November 16th freeway opening in comparison with the 90-day period prior to the freeway opening. The hospital also reported a dramatic decline in the seriousness of the injuries and the length of hospitalization required.

"Haver revealed that since the November freeway opening of 1953, only 85 traffic accidents have occurred within the city limits, compared with 210 during the same period last year. This is a 58 percent reduction of auto accidents, Haver pointed out.

"Although figures have not been compiled for February, data shows that 32 accidents occurred last November and December compared with 71 and 73 during those months in 1952, while 21 accidents were reported in January of this year compared with 66 during January of 1953."

(Quoted from August 8, 1954, edition of San Diego *Union*):

"A prayer for motorists' safety that state highway officials voiced at the ceremony opening the $10 million Oceanside-Carlsbad freeway nine months ago is being answered, according to local traffic safety records.

"The new superhighway skirting the business districts in both cities was opened last November.

"Previously, highway officials had considered this area a major bottleneck on the San Diego-Los Angeles coast arterial. Traffic violations and accidents were increasing annually as through traffic steadily mounted on Old Highway 101 through the center of both towns.

"At the ribbon-cutting ceremonies November 16th, Lieutenant Governor Harold Powers said he hoped the new 10-mile divided highway would improve safety conditions.

"Police Chief Patrick said yesterday that traffic accidents in Oceanside declined 59 percent the first six months of this year.

"He compared a total of 396 accidents in the first six months of 1953 with only 163 in the same period this year. The accident rate showed a similar decline in nearby Carlsbad."

Tulare Freeway

An eight-mile freeway which carried State Route 4 (US 99) around the City of Tulare exhibited a similar effect in reducing accidents over the entire City of Tulare. This freeway was opened on December 11, 1953. The following data refer to a 10½-month period since the freeway was opened compared to an identical period one year earlier. The comparative study embraces all streets within the city limits of Tulare plus both the old and new US 99 highways between the limits of the freeway at Tulare Airport on the south and Tagus Ranch on the north. Sources of accident data were from the files of the Division of Highways and the records of the Tulare Police Department.

The freeway bypass diverted approximately 70 percent of the US 99 highway traffic, which previously flowed through the city, although traffic on the old and new routes combined had increased 7 percent in the one-year period. Since the total US 99 highway flow is essentially carried on the two routes, the accident comparisons are between the old route alone in the "before" period to the sum of the old route and the freeway bypass in the "after" period. Even on this basis, there was a reduction of 63 percent in total accidents in the period since construction of the freeway. Other streets in the City of Tulare showed a drop of 23 percent in total accidents. The freeway construction effected an average reduction in accidents of 43 percent for the entire area.

Table 6 shows a comparison of accidents by type in the "before and after" periods.

On the severity basis, there was no significant change in fatal accidents, primarily due to the smallness of the sample. However, for the new freeway plus the old route, compared to the old alone in the "before" picture, there was a reduction of 44 percent in minor injuries and 47 percent in major injuries due to motor vehicle accidents.

Another interesting sidelight, following freeway construction in Tulare, was the reduced enforcement necessary because of improved traffic and accident conditions. Chief of Police Virgil Kelley of Tulare stated that after the freeway was opened the traffic and accident situation within the city was so much better that he was able to reduce his total police force from 22 to 17 officers. In addition, the Highway Patrol has been able to reduce enforcement personnel on US 99 in Tulare County by three men a day, transferring these men to other areas in the county where they are now needed more than on the main north-south highway.

Los Angeles Freeways

As shown in the Oceanside-Carlsbad and Tulare studies, freeways can exert beneficial effects on accidents for the entire area in addition to direct accident reduction for freeway travel. This effect is, of course, less pronounced in the City of Los Angeles with its thousands of miles of city streets and 1953 travel in excess of 10 billion vehicle miles.

Figure 5 compares injury accident rates on surface streets in the City of Los Angeles to injury accident rates on full freeways within the City of Los Angeles. Basically, it may be noted that the injury accident rate for these freeways is less than one-third of that on surface streets. However, the reduction of pressures on many city arterials, due to the expanding portion of travel which is being carried on full freeways, should have an effect on the over-all accident rate. In this connection, completion of freeways at an accelerated rate beginning about 1949 appears to be reflected in a small but steady decline in the injury accident rate on surface streets.

For the two-year period, 1951 to 1953, travel on freeways increased from $4\frac{1}{2}$ percent to 6 percent of the total travel within the city. The

INJURY ACCIDENT RATES PER MVM ON SURFACE STREETS & FREEWAYS IN LOS ANGELES

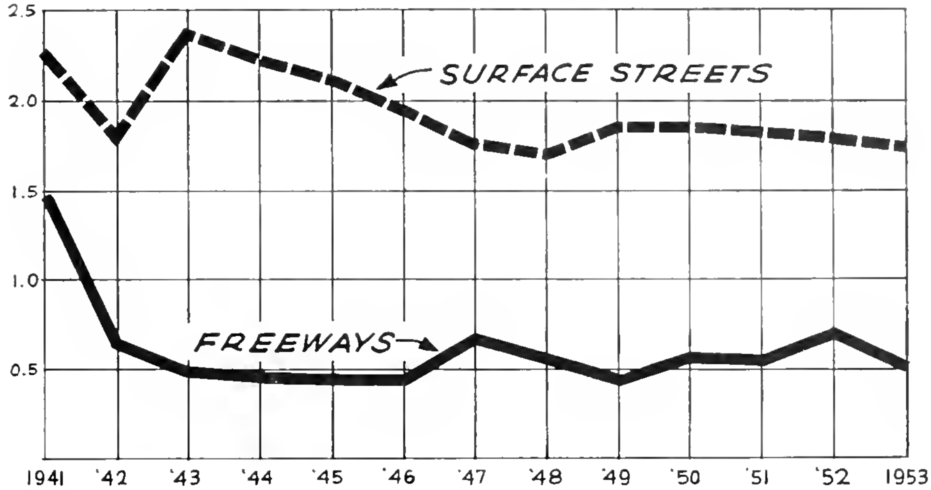


Fig 5

direct result of this additional $1\frac{1}{2}$ percent of the travel on facilities with a rate one-third as high effected a reduction of 1 percent in the injury accident rate city-wide. In addition, the surface street injury accident rate, undoubtedly due to a major extent to the relief offered by the freeways, declined 2.76 percent in the same two-year period.

Economy of Freeways

Studies by highway economists both within and without the State Division of Highways have shown conclusively that freeways are self-liquidating and pay for themselves within a relatively short period of time by savings to the motoring public.

A report entitled "The Economy of Freeways" by Lloyd Aldrich, City Engineer of Los Angeles, dated June, 1953, includes the following in its introduction:

"In a previous report the capacity, time savings, and safety of freeways were compared with surface streets. Therein it was shown that a freeway on an equal number of traffic lanes basis handles three times the number of cars at twice the average speed and at an accident rate five times as favorable as a comparable surface artery."

Mr. Aldrich further states, as minimum benefits to motorists using freeways, the following average savings per vehicle mile:

(1) Gasoline savings	0.33¢
(2) Maintenance cost savings due to elimination of stop and go travel	0.24¢
(3) Accident savings	0.56¢
(4) Time savings (commercial vehicles only)	0.87¢
Total	2.00¢

In addition to the 2 cents per mile of freeway operation savings, he further lists as additional benefits to the motorist and citizen, "* * * stabilization or enhancement of property

TABLE 6—COMPARISON OF ACCIDENTS
(Number of Accidents)

Location	Fatal accidents		Injury accidents		PDO accidents*		Total	
	Before	After	Before	After	Before	After	Before	After
US 99:								
Freeway	No Rd.	2	No Rd.	8	No Rd.	13	No Rd.	23
Old route	4	2	48	8	114	29	166	39
Totals	4	4	48	16	114	42	166	62
Other streets:								
Rt. 134	0	0	12	6	49	23	61	29
City streets	1	0	13	20	79	70	93	90
Totals	1	0	25	26	128	93	154	119
Total area	5	4	73	42	242	135	320	181

* Property damage only.

values, relief of existing overburdened surface arteries, doubling of the practical radius of real estate development on a travel time basis, increased access to recreational or cultural facilities, increased mobility in times of disaster emergencies, increased tourist travel, reduction of strain of driving, and all of the other well known advantages in betterment of transportation."

From Mr. Aldrich's report we also find:

Application of Savings on Freeways Already Completed

"Applying the above listed benefits to the record of vehicle mileage on presently completed sections of freeways, we find that, on the very conservative basis used herein, in the three-year period 776,100,000 vehicle miles of travel at 2 cents per mile savings resulted in a savings of $15,522,000. The original cost of the 16.57 miles of freeways under study was $42,026,683. If the savings at the above rate could be applied to payment for the freeways, their original cost would be amortized in less than 10 years. In addition to these remarkable direct benefits to the motorist, we have also the unevaluated benefits to the region, which are of vast importance."

Auto Club Report

The most recent report on this subject is entitled *An Appraisal of Freeways vs. Surface Streets in the Los Angeles Metropolitan Area* as prepared by the Engineering Department of the Automobile Club of Southern California, dated August, 1954.

This report is primarily based on comparable test runs made on Los Angeles freeways and surface streets during off-peak traffic periods so as to avoid abnormal situations. The following table shows comparative data and costs of these test runs:

Test Runs on Freeways and Surface Streets

	Via freeways	Via surface streets
Date	June 2, 1954	June 3, 1954
Start	9.30 a.m.	9.30 a.m.
Car	Ford No. 8	Ford No. 8
Driver	Julius Paulson	Julius Paulson
Observer	H. F. Holley	H. F. Holley
Distance	133.3 miles	123.8 miles
Time	165 minutes	380 minutes
Gas used	6.88 gallons	8.57 gallons
Miles per gallon	19.38	14.44
Average speed	48.473 m.p.h.	19.547 m.p.h.
Number of signalized intersections	0	578
Average number of signals per mile	0	4.67
Number of stops made	0	298
Average number of stops per mile	0	2.41
Operation cost per mile		
(a) Gasoline	1.545 cents	2.076 cents
(b) Time at 2 cents per minute	2.476 cents	6.139 cents
Total cost	4.021 cents	8.215 cents

Basically, the report shows that "The 45 miles of completed freeways in the central area of metropolitan Los Angeles are saving motorists $50,000,000 a year! They cost a total of $143,000,000. If savings could be applied to amortization, total construction and right-of-way costs would be repaid in less than three years."

The basis of this surprising statement is the following economic summary developed from the test runs previously shown, which utilizes the saving of 4.194 cents per vehicle mile.

ECONOMIC SUMMARY

Miles of completed freeways under study	45.1
Weighted average daily traffic (vehicles per day)	72,400
Estimated vehicle miles per day traveled on completed freeways	3,264,200
Vehicle miles per year traveled on completed freeways	1,191,433,000
Saving in operation cost on freeways as opposed to travel on surface streets	
A. Per mile	4.194¢
B. Per year	$49,968,700
Estimated cost of 45.1 miles of completed freeways	$143,000,000
Number of years required for saving in operation cost to pay entire cost of freeways	2.86

Freeway Progress

As of January 1, 1955, California had 1,275 miles of multilane divided highway in operation, far more toll-free mileage of this type than any other state, with an additional 275 miles under construction or advertised for bids. Additional multilane divided highway projects budgeted through June 30, 1956, bring California's total of this type of highway completed, under contract, advertised or budgeted to 1,658 miles, or about 12 percent of the entire State Highway System.

Of this mileage, 170 miles consist of full freeways completed, with an additional 150 miles under contract or advertised. When these freeways plus those budgeted through June 30, 1956, are completed, California will have nearly 400 miles of this highest and safest type of highway facility.

As stated at the outset of this report, there is no room for complacency about California's traffic fatality picture even though it appears to be improving. The statistics which indicate that California's full freeways compare more than favorably with turnpikes and other modern facilities in other states must be regarded as a challenge to our engineers, our enforcement officers and other safety workers to continue at full tilt their battle against needless death on our streets, roads and highways.

HUGH CULLEN—FABULOUS FIGURE

Oil production and highway construction are akin in many ways. Hence, road engineers should be interested in a book recently off the presses of Prentice-Hall, Inc., New York. It is "Hugh Roy Cullen—A Story of American Opportunity." The authors are Ed Kilman and Theon Wright.

The book tells the life story of Hugh Cullen, fabulous Texas oil producer, an amazing figure in the contemporary American scene. One of the greatest philanthropists of our time, he has given away cash and oil properties valued at more than $175,000,000.

IT PAYS TO WAIT

If you're extra tired when you finish your day's work, it may pay you to wait until the rush is over before starting to drive home. The most dangerous hours of the day are those when people are on their way home, weary, impatient and often in a hurry.

KEEP YOUR DISTANCE

Drivers who are traveling faster than most of the traffic should never drive close to a car they intend to pass, says the California State Automobile Association. If you drive too close to the car ahead you cannot see around it and may be confronted by an oncoming vehicle just as you decide to pass.

Cost Index

Highway Construction Costs Down During Fourth Quarter 1954

By RICHARD H. WILSON, Assistant State Highway Engineer; H. C. McCARTY, Office Engineer; JOHN D. GALLAGHER, Assistant Office Engineer

On the basis of prices submitted on state highway construction projects in the last three months, the California Highway Construction Cost Index indicates a drop of 7.5 percent in construction costs during the fourth quarter of 1954. This decrease largely offsets the 9.9 percent rise in the previous quarter, bringing the Index down 15.6 points, from 207.8 to 192.2 (1940 = 100). This is within 3.2 points of the second quarter of 1954, when at 189.0 it reached the lowest point since the second quarter of 1950.

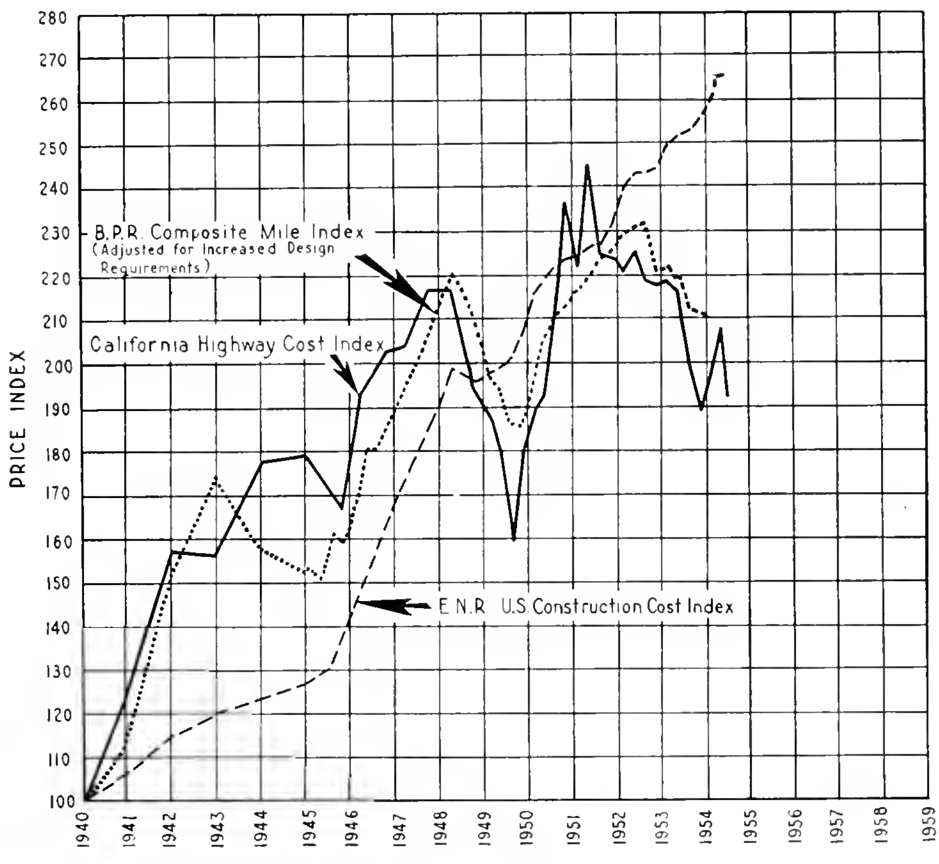
This 192.2 Index figure for the fourth quarter of 1954 is 21.7 percent below the all-time high of 245.4 in the fourth quarter of 1951 but is 20.1 percent above the 160.0 in the first quarter of 1950 which is the low point since the end of World War II.

The accompanying tabulation shows the California Highway Construction Cost Index by years from 1940 to 1949 and by quarters from 1950 through 1954.

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PRICE INDEX CONSTRUCTION COSTS

1940 = 100



FISCAL YEARS
(JULY 1 TO JUNE 30)

THE CALIFORNIA HIGHWAY CONSTRUCTION COST INDEX

Year	Cost Index
1940	100.0
1941	125.0
1942	157.5
1943	156.4
1944	177.8
1945	179.5
1946	179.7
1947	203.3
1948	216.6
1949	190.7
1950 (1st quarter)	160.6
1950 (2d quarter)	180.0
1950 (3d quarter)	189.2
1950 (4th quarter)	194.8
1951 (1st quarter)	215.4
1951 (2d quarter)	238.3
1951 (3d quarter)	221.9
1951 (4th quarter)	245.4
1952 (1st quarter)	224.8
1952 (2d quarter)	224.4
1952 (3d quarter)	221.2
1952 (4th quarter)	226.2
1953 (1st quarter)	218.3
1953 (2d quarter)	217.5
1953 (3d quarter)	218.0
1953 (4th quarter)	216.7
1954 (1st quarter)	199.4
1954 (2d quarter)	189.0
1954 (3d quarter)	207.8
1954 (4th quarter)	192.2

It is, however, the opinion of this department that the 7.5 percent drop is not necessarily indicative of a continued downward trend in construction costs during the immediate future. This opinion still is based on the premise that the factors which offset increased labor costs in the contracting industry have reached a point of balance and that the effect of such increased costs for labor must become apparent in the Index in the immediate future.

On the other hand, the currently large number of highway contracts above the million-dollar mark, involving large quantities of work and materials, together with continued keen competition among contractors have a marked effect in depressing unit prices. Nevertheless, as stated, it is thought that these factors will not remain strong enough to continue balancing the effect of increasing labor costs.

Average Unit Prices

Study of the average unit prices bid during the fourth quarter of 1954 for the eight principle items upon which the California Highway Construction Cost Index is based (see accompanying tabulation) show a drop in all but plant-mixed surfacing, which is up 3.2 percent, and portland cement concrete pavement, which rose 3.9 percent. Of the other items, roadway excavation was down 18.5 percent, untreated rock base, down 3.8 percent, structure concrete dropped 7.1 percent, bar steel down 1.0 percent and structural steel dropped 16.6 percent.

The decrease in the average unit cost of roadway excavation from $0.43 to $0.35 per cubic yard may be attributed largely to the large volume dirt moving involved in individual projects. The total volume of roadway excavation for the quarter was 6,300,000 cubic yards and of this amount, nearly 3,000,000 cubic yards were included in only three contracts. This item unquestionably was a major factor in the 7.5 percent decline in the Index.

Structural Steel

Similarly the average unit price of structural steel for highway contracts awarded during the fourth quarter of 1954 was $0.135 per pound as compared to $0.162 per pound in the third quarter. Here again the quantity in individual contracts was a factor. Of the 7,680,000 pounds required by all contracts 6,200,000 pounds were concentrated in only four contracts. Also in the case of structural steel, as was reported in the Cost Index release for the third quarter, the total quantity in the third quarter was only about 4,000,000 pounds, as compared to the 15,000,000 pounds in the second quarter and over 7,000,000 pounds in the fourth quarter; also most of the 4,000,000 pounds in the third quarter was for projects located in outlying areas, far from sources of steel. This situation alone would account for an abnormally low average unit price for structural steel in the second quarter and an abnormally high price in the third quarter, all of which was noted in the third quarter release. From the average prices for the year preceding it would appear that the $0.135 for the fourth quarter is a relatively normal average at this time.

The accompanying comparative chart, showing the California Highway Construction Cost Index, the *Engineering News-Record* Construction Cost Index and the United States Bureau of Public Roads Composite Mile Index is incomplete in this release in that figures on the bureau's Composite Mile Index are not as yet available for the last two quarters.

The *Engineering News-Record's* over-all Construction Cost Index continues to rise gradually (up 0.26 percent) and one wonders how long this will continue. It is in this Index that the effect of continuing increases in labor costs is most perceptible as the *News-Record's* Index is based upon wages and material costs and not on bid prices.

Competition Among Bidders

The U. S. Bureau of Public Roads Composite Mile Index and the California Highway Construction Cost Index are both based on actual average bid prices for highway contracts, the one on a national scale, the other limited to California.

That competition among bidders for state highway work remains keen is shown on the accompanying Sum-

CALIFORNIA DIVISION OF HIGHWAYS—AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Crusher run base, per ton	Plant mix surfacing, per ton	Asphalt concrete pavement, per ton	PCC pavement, per cu. yd.	PCC structures per cu. yd.	Bar reinforcing steel, per lb.	Structural steel, per lb.
1940	$0.22	$1.54	$2.19	$2.97	$7.68	$18.33	$0.040	$0.083
1941	0.26	2.31	2.84	3.18	7.54	23.31	0.053	0.107
1942	0.35	2.81	4.02	4.16	9.62	29.48	0.073	0.103
1943	0.42	2.26	3.71	4.76	11.48	31.76	0.059	0.080
1944	0.50	2.45	4.10	4.50	10.46	31.99	0.054	0.132
1945	0.51	2.42	4.20	4.88	10.90	37.20	0.059	0.102
1946	0.41	2.45	4.00	4.68	9.48	37.38	0.060	0.099
1947	0.46	2.42	4.32	5.38	12.38	48.44	0.080	0.138
1948	0.55	2.43	4.30	5.38	13.04	49.86	0.092	0.126
1949	0.49	2.67	4.67	4.64	12.28	48.67	0.096	0.117
1st quarter 1950	0.34	2.22	3.65	3.74	----	40.15	0.077	0.081
2d quarter 1950	0.40	2.13	4.48	3.74	10.86	43.03	0.080	0.105
3d quarter 1950	0.41	2.32	4.25	5.50	10.91	44.34	0.093	0.131
4th quarter 1950	0.42	2.81	4.64	4.61	12.55	43.18	0.098	0.120
1st quarter 1951	0.45	3.07	4.06	5.22	11.71	46.38	0.103	0.206
2d quarter 1951	0.63	3.88	4.56	4.63	12.93	51.50	0.105	0.166
3d quarter 1951	0.56	2.88	4.59	3.90	12.41	46.14	0.107	0.165
4th quarter 1951	0.66	2.91	5.66	4.89	12.71	49.38	0.105	0.169
1st quarter 1952	0.56	3.25	4.88	4.77	14.25	47.46	0.094	0.152
2d quarter 1952	0.53	3.19	5.29	4.13	14.20	49.12	0.091	0.143
3d quarter 1952	0.55	2.61	5.49	4.60	12.80	48.21	0.094	0.132
4th quarter 1952	0.66	2.68	4.97		12.53	48.45	0.094	0.128
1st quarter 1953	0.45	*2.48	5.27	4.46	12.47	53.19	0.098	0.150
2d quarter 1953	0.50	2.07	5.38	4.59	13.06	52.68	0.091	0.132
3d quarter 1953	0.54	2.15	5.30	4.82	13.78	49.23	0.092	0.129
4th quarter 1953	0.48	2.11	4.74	4.47	14.77	53.41	0.105	0.139
1st quarter 1954	0.45	2.28	4.23	4.78	14.89	47.52	0.092	0.126
2d quarter 1954	0.38	2.09	4.29	5.18	14.28	47.12	0.093	0.114
3d quarter 1954	0.43	1.85	4.68	7.00	12.63	49.59	0.095	0.162
4th quarter 1954	0.35	1.78	4.83		13.13	46.08	0.094	0.135

* Untreated rock base substituted for crusher run base at this point.

NUMBER AND SIZE OF PROJECTS, TOTAL BID VALUES AND AVERAGE NUMBER OF BIDDERS

(July 1, 1954, to December 31, 1954)

	Project volume						
	Up to $50,000	$50,000 to $100,000	$100,000 to $250,000	$250,000 to $500,000	$500,000 to $1,000,000	Over $1,000,000	All projects
ROAD PROJECTS							
Number of projects	132	40	35	13	9	3	232
Total value *	$2,116,386	$2,739,564	$5,595,371	$4,496,969	$5,732,255	$4,058,682	$24,739,227
Average number of bidders	4.9	6.1	7.7	9.0	8.3	8.7	5.9
STRUCTURE PROJECTS							
Number of projects	17	4	7	4	6	2	40
Total value *	$363,054	$312,188	$1,100,136	$1,476,875	$3,792,222	$2,896,540	$9,941,015
Average number of bidders	7.9	10.0	12.3	13.0	8.7	11.5	9.7
COMBINATION							
Number of projects	......	......	......	......	1	14	15
Total value *	......	......	......	......	$817,627	$33,632,557	$34,450,284
Average number of bidders	......	......	......	......	10	10.3	10.3
SUMMARY							
Number of projects	149	44	42	17	16	19	287
Total value *	$2,479,440	$3,051,752	$6,695,507	$5,973,844	$10,342,104	$40,587,779	$69,130,526
Average number of bidders	5.2	6.4	8.5	9.9	8.6	10.2	6.7

* Bid items only.

Total Average Bidders by Months

	July	August	September	October	November	December	Average for six months
1954	6.7	6.0	6.5	7.9	7.0	6.4	6.7
1953	6.2	6.9	6.4	7.6	7.4	7.7	6.9

mary of Bidders, broken down by number and size of contracts and by road and bridge construction for the last six months of 1954. The average number of bidders was 6.9 for the fiscal year ending June 30, 1954, which compares with 5.7 for the fiscal year ending June 30, 1953.

There follows this release a summary of the number of bidders prequalified to bid on state highway work in California broken down by the several brackets of bidding limitation:

The data show that 780 contractors were prequalified to bid state highway projects as of July 1, 1954. Based on their maximum ratings, the 780 contractors are grouped as follows:

10,000,000 and over	41
5,000,000 to 10,000,000	72
2,500,000 to 5,000,000	126
1,500,000 to 2,500,000	194
1,000,000 to 1,500,000	236
500,000 to 1,000,000	355
250,000 to 500,000	498
100,000 to 250,000	639
50,000 to 100,000	747
up to 50,000	780

The combined bidding capacity on June 30, 1954, of these 780 contractors was $1,472,000,000, or in round figures one billion four hundred seventy-five million dollars.

In arriving at this combined bidding capacity figure all ratings in excess of 20 million dollars are entered at the 20-million-dollar figure.

Last year at this time there were 691 prequalified contractors with a combined bidding capacity of $1,345,000,000, using the 20-million-dollar cutoff point.

New Record Made

State highway construction in California has set a new all-time record both in value of contracts under way and in mileage of multilane divided highways in the construction stage, it was reported by the Department of Public Works.

The department reported that the construction value of the 293 Division of Highways contracts under way on the first of the year amounted to $209,215,100, surpassing the previous high of $207,693,000 on October 1, 1954. This is the seventh consecutive month on which the construction value of going contracts has exceeded $200,000,000.

At the same time the department reported construction under way on 228 miles of multilane divided highway, most of it of the freeway or expressway type, and an additional 47 miles advertised for bids. This total of 275 miles of multilane divided highway in the construction stage compares with the previous high of 271 miles last October.

Completed multilane divided highways in California now total 1,275 miles, an increase of 153 miles since January 1, 1954.

Retirements *from* Service

Nate W. Downes

In May of 1949, as the result of selection through an open national competitive civil service examination, Nate W. Downes took up the assignment of organizing and directing a section within the Division of Architecture conceived for the purpose of surveying and reporting on state institutions, their equipment and utilities to the end that authentic information would be made available as to their physical condition, embracing recommendations covering items of repair, rehabilitation and improvements required to bring these properties up to an acceptable physical and functioning standard. He was further charged with the responsibility of prescribing for the maintenance and operation of these properties at and on this same standard.


NATE W. DOWNES

In the period since May, 1949, a complete report has been made on every state institution in the Departments of Corrections, Education, Mental Hygiene, Military, and Veterans' Affairs, and Youth Authority.

Guide for Planned Program

These reports have afforded a source of information for budgeting and a guide for carrying on a planned program for accomplishing the objective, presenting items with cost estimates classified in the order of their need and importance.

With the completion of his work, Downes retired from state service.

Downes' program is presently in operation in the new Porterville State Hospital, the new Deuel Vocational

. . . Continued on page 57

W. K. Daniels

W. K. (Wes) Daniels, age 62 years, retired from his position with the Division of Architecture under the State Employees' Retirement System on February 1, 1955, after completing almost 40 years of state service.


WES K. DANIELS

Serving in the executive position of Assistant State Architect in charge of administrative services with headquarters in Sacramento, Daniels planned, organized and directed the state-wide activities of the division relating to fiscal affairs, contracts, estimating, construction budgets, support operating budgets, personnel, office services, accounting and contract board of review.

Born July 22, 1892, in Stockton, California, he attended the public schools there and sold newspapers during his spare time. He left home

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H. R. Kriegh

H. R. Kriegh, Associate Highway Engineer, retired from service with the California Division of Highways on December 1, 1954.

He started work for the division on April 4, 1932, as assistant resident engineer on construction for District VII, and spent a number of years in the field on construction work, later transferring to the district office, where he served in various positions until retirement. He has been in the Construction Department office for the past seven years, as assistant district construction engineer, where he has done a topnotch job of supervising and controlling engineering allotments and costs, handling contractors' requests for extensions of contract time, judging contractors' claims, securing and compiling all pertinent information, and preparing the data for presentation to the Board of Review.


H. R. KRIEGH

Born in Kansas

Kriegh was born in Kansas, and received his formal engineering education at the University of Kansas. His education did not end, however, with his last class at K. U., for he has continued to expand his knowledge along scientific lines, becoming expert in such subjects as geology, mineralogy, hydraulics, mathematics, and celestial navigation.

His first employment as an engineer was with the Santa Fe Railroad, as chairman on a survey party. He soon advanced to the position of party chief, and later to the position of resident engineer on construction. He

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NATE W. DOWNES

Continued from page 56 . . .

nstitution at Tracy, and the California State Prison at Soledad.

With a background of five and one-half years' experience in appraising the physical condition of California state institutions, it is the opinion of Downes that such a program should be installed state-wide without delay.

Born in Illinois

Born in Rock Island, Illinois, Downes moved to Nebraska with his parents at a very early age where he was educated in the public schools, graduating from the University of Nebraska in 1907 in mechanical engineering.

First employed by the Freeborn Engineering Company, Consulting Engineers, Kansas City, Missouri, moving then to the Division of Buildings and Grounds of the School District of Kansas City, Missouri, he finally landed in the U. S. Army with the 81st Engineers in 1918. On being discharged, he engaged in consulting engineering practice in Dallas, Texas, and after four years in this capacity, returned to the School District of Kansas City, Missouri, as chief engineer and superintendent of buildings and grounds, later being identified as assistant superintendent of schools in charge of buildings and grounds, which position he held for 30 years.

Downes is a life member of the American Society of Mechanical Engineers, the American Society of Heating and Ventilating Engineers, and a registered mechanical engineer with the States of California and Missouri.

SAFER, EFFICIENT HIGHWAYS

"As you know so well, the phrase safer, more efficient highways' actually involves a vast complex of governmental, commercial, and industrial relationships—plus the daily desires and transportation needs of a freedom-loving people with 58 million motor vehicles at their disposal."—From speech by Congressman J. H. McGregor of Ohio at 40th Annual Meeting of American Association of State Highway Officials, Seattle, November 9, 1954.

W. K. DANIELS

Continued from page 56 . . .

at the age of 17 years to earn his own living and to establish a career. He secured a job as office boy in an architect's office in Sacramento for training to become a draftsman.

Daniels entered state service as a junior architectural draftsman on May 17, 1914, with the State Board of Harbor Commissioners during a program of redevelopment of pier entrance facilities in San Francisco. He transferred to the division's Sacramento office a year later in the same capacity. During the following decade he worked his way up in the architectural drafting room through promotional civil service examinations plus home studies to the position of chief architectural draftsman. He was appointed deputy chief of division in 1926 and shortly thereafter received his certificate to practice architecture in the State of California. He served later as administrative assistant and on September 8, 1937, he was reclassified as Assistant State Architect, Administrative, which position he has held since with the exception of the period 1938-1940 when he was appointed Acting State Architect following the retirement of George B. McDougall. During World War I he served with the U. S. Navy assigned to a subchaser.

When Daniels entered state service in 1914 the organization had a total personnel of 37 employees. The construction output totaled $1,365,000 for the particular biennium (two years). During his 40 years of service the peak personnel for the division increased to a total of 1,243 employees. Construction contracts in force have amounted to $110,000,000 for a single year period which represents a project level cost of $137,000,000.

In addition the division's peak work load relating to the safety of design and construction of public school buildings in California reached a high of $232,810,000 in school building valuations for a single year.

Daniels has served under nine governors, ten public works directors and two state architects.

H. R. KRIEGH

Continued from page 56 . . .

remained with the Santa Fe for 12 years, and worked one year each for the Union Pacific Railroad and the City of Oakland before coming to the Division of Highways.

Kriegh enlisted in the Army during World War I, and earned a commission as 2d lieutenant via officers candidate school. He remained active in the Reserve, and at the start of World War II resumed active duty, serving as a captain in the U. S. A. F. in India and China.

Back to Ranch

Upon retirement, "Hobe," as he is known to his friends and associates, moved with his family back to his ranch near Palmdale which he homesteaded some years ago. He then made an extensive trip through the Middle West, where he visited one of his sons and other relatives and friends.

He has now returned, and is planning to build a new home on the ranch, with a lot of the work to be done by himself. He is also writing a work on celestial navigation, including computation of the necessary tables, which will be a considerable improvement on the methods used during World War II.

Just to insure that he has no idle time on his hands, he is considering the possibility of entering into some business enterprise in the Palmdale-Lancaster area with his youngest son when the latter returns from a tour of duty with the Army in Korea.

WATCH RAILROAD CROSSING

Fourteen hundred persons were killed in the United States during 1953 as a result of accidents in which a motor vehicle collided with a railroad train, reports the National Automobile Club.

"PROFESSIONAL CARELESSNESS"

Don't let your "professional standing" as a driver lead you into "professional carelessness," advises the National Automobile Club. No matter how long you have been driving, it always pays to be careful.

RIPRAP JOB

Continued from page 38 . . .

extreme low tides. These tides rise and fall quite abruptly and thus allow only about four hours of working time to start and to complete a given section. During this short period the contractor must excavate the toe ditch to a predetermined depth with caterpillars and draglines, place the rock for the base, sometimes from elevation −8.0 feet to elevation +3.0 feet, chink all voids, place the 3-foot blanket of gravel shore protection and place enough of the roadway embankment material to prevent the tides from washing out the work which has been completed.

Construction Problem

The working period can be extended somewhat by getting in ahead of time and pushing sand berms 8 to 12 feet high on the seaward side of the work with dozers. However, when the tide builds up as much as two feet high on the outside of this sand berm, any number of dozers cannot successfully compete with the destructive erosion of the rising tide and surf action, and then the construction area floods. When this happens the contractor's equipment must then be moved out immediately. If the cycle of work is completed in time the ocean is whipped, but if it is not, the destructive wave action will cut out the roadway embankment, move the rocks out of position and much of the work must be done all over again.

After the rock riprap is successfully placed to elevation +3.0, a frontal sand beach starts to build up and the balance of the construction work can be carried on during moderate tides and except for extreme tides and storm periods very little further trouble is encountered. From elevation +12.0 to the roadway elevation averaging +23 feet a 3-foot blanket of rocks, weighing 500 pounds to 2 tons, is placed over the 3-foot-thick blanket of graded gravel. This last item of construction completes the riprap operation, and the balance of the contract work will follow normal highway building procedure.

At present quarry operations are conducted in a limestone deposit on the Guadalasca Rancho now known as the Broome Ranch 13 miles south of Oxnard on US Alternate Route 101.

James Wilson is project manager for McCammon-Wunderlich Company, Ken Omsberg is superintendent, and Robert Nutt is in charge of riprap construction.

CHICO PROJECT

Continued from page 40 . . .

contractor and T. G. Smith and T. R. Lammers were the Resident Engineers. Major contract items on this $376,000 unit included 122,170 tons of untreated rock base; 26,000 tons of plant-mixed surfacing (dense graded); and 3,450 tons of plant-mixed surfacing (open graded).

Fourth and Last Unit

The fourth and last unit of the project was a contract for completing the grading from the Oroville Wye to 3.8 miles north and for the placing of base and surfacing from Oroville Wye to the junction of Route 87. Work began on January 4, 1954, and the road opened to traffic as mentioned above on December 17th. The major items on this $690,000 contract were: 28,000 cubic yards roadway excavation; 93,000 cubic yards imported borrow; 40,000 cubic yards imported subbase material; 55,500 tons mineral aggregate for cement treated base; 30,160 tons plant-mixed surfacing (dense graded) and 4,160 tons plant-mixed surfacing (open graded). Contractors on the project were Ukropina, Polich, Kral & Ukropina of San Gabriel. R. N. Smith was the Resident Engineer.

The total of the allotments for the four contracts described above is about $2,317,000. Right of way acquisition costs for this 18.7 mile length totaled approximately $185,000. Thus, the total cost of this new facility, exclusive of engineering, was $2,532,000, or about $135,000 per mile.

FAMILIES AND THE AUTOMOBILE

Seventy percent of all the families in the United States today own automobiles.

SCHOOL PATROLS

Continued from page 6 . . .

side on the green light and be unobserved under the hoods of waiting cars when the signal light changes. Patrols, adult guards, or policemen are still necessary for the safety of children at many signalized intersection locations, particularly on heavily traveled multilane streets.

Safety at school crossings is a problem that requires cooperation and acceptance of responsibility by all concerned. The school patrols and those responsible for them are making a very substantial contribution to safety, and deserve credit for their fine work. They are doing their part of a job which should be shared with parents, school districts, enforcement officers, other officials, and motorists.

SOURCE OF INFORMATION

CENTRAL CALIFORNIA CONFERENCE OF SEVENTH-DAY ADVENTISTS

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: Early this week one of our denominational auditors laid a copy of your fine magazine *California Highways and Public Works* on my desk. I found this magazine to be a real dispenser of information which I have desired to have as I have driven over our highways and observed the work being done and corrective measures being taken to make our highways safer and more enjoyable to use.

ROBERT E. OSBORN
Secretary-Treasurer

MAGAZINE HELPFUL

CITY OF MODESTO
Traffic Engineering Department
Modesto, California

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: Your November-December issue was outstanding. The articles on "Financing of Grade Separations," "Guard Railing Reduces Severity of Accidents," "Traffic Signals," "Road Bond Issue," "Cost Index," and "Traffic Count," were all interesting and extremely valuable to me.

(Signed) DOUGLAS J. CARMODY
Traffic Engineer

Rod Richardson Gives Up State Post for New Job

Rodney C. Richardson, since September, 1950, assistant to the Director of Public Works, resigned on January 4th to assume the duties of vice president of the Benmatt Organization of Los Angeles and Chicago.

ROD RICHARDSON

Richardson was a Sacramento resident for the past 10 years, and during that time served in various executive positions in State Government. Originally he came to the Capitol to act as Secretary of the Governor's Veterans Committee under Earl Warren in November, 1944. Thereafter he was appointed Assistant Chief, State Airport Master Planning Staff; Coordinator of Centennial Affairs; and Deputy Director, Governor's Office of Planning and Research. Along with his other duties in the State Department of Public Works, he served as Secretary of the Engineering Division, Governor's Traffic Safety Conference, for the past four years.

Educated in Southern California, he attended U. C. L. A., U. S. C., and the American Institute of Banking. Orig-

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Johnson Assumes Post Vacated by Hal H. Hale

On January 1, 1955, Alfred E. Johnson, immediate past president of the American Association of State Highway Officials, became executive secretary of the association, succeeding Hal H. Hale, who has resigned to

ALFRED E. JOHNSON

accept a position with the Association of American Railroads.

Johnson had been Chief Engineer of the Highway Department of the State of Arkansas since 1947, a post which he attained through successive promotions after entering the department as rodman and instrument man in 1927.

He was born in Harrison, Arkansas, July 10, 1907, and studied engineering at the University of Arkansas. During his professional career he has been active in numerous engineering organizations, served as president of the Southeastern Association of State Highway Officials, and concluded his term as president of A. A. S. H. O. in November, 1954.

Johnson is well known nationally, particularly in Washington, D. C., where he has often represented A. A. S. H. O. before many important meetings and before the Congress.

C. A. Maghetti New Secretary Highway Body

C. A. Maghetti, of Davis, editor of the Davis *Enterprise* for the past 20 years, was appointed secretary of the California Highway Commission January 1, 1955, succeeding R. C. Kennedy, resigned.

C. A. MAGHETTI

Maghetti has held several posts in the past years and is at present chairman of the Davis Housing Authority. He served as postmaster in Davis for two terms, during which time he was president of the California Postmasters Association. He is a past president of the Davis Rotary Club and a charter member of 28 years' standing. He served a term as director of the Yolo County Fair Board, for two terms as chairman of the Yolo County Republican Central Committee and for the past 10 years as chairman of the Salvation Army Relief in Davis.

Until his appointment he was a director of the California Newspaper Publishers Association. He is a member of the San Francisco Press Club, the Faculty Club of the University of California at Davis, and the Chamber of Commerce.

State Highway Contracts Awarded

NOVEMBER, 1954

Alameda County—Across the Eastshore Freeway, 0.1 mile north of south city limit of Emeryville. Furnish and install one sign bridge with sign lighting. Contract awarded to Ets-Hokin & Galvan, $8,694.

Contra Costa County—US 40—At the intersection of US 40 with Giant Road in and adjacent to the City of Richmond. Install highway lighting system and span-wire mounted three-way flashing beacon. Contract awarded to Hall-Sloat Electric Co., Inc., $1,967.

Contra Costa County—US 40—Between 0.2 mile south of Jefferson Avenue and south of County Road 24. Grade and pave with portland cement concrete on cement treated subgrade; ramps interchange lanes, frontage roads and city streets graded and surfaced with plant-mixed surfacing, and construction of nine reinforced concrete bridges, all to provide a six-lane divided freeway. Contract awarded to M & K Corp. and Fredrickson & Watson Const. Co., $5,107,822.

Contra Costa County—SR 24—On Mount Diablo Boulevard at Oakland Street-Thomson Avenue and at Moraga Road, in the Town of Lafayette. Modify two independently operating two-phase full traffic actuated signal systems into an interconnected, coordinated system. Contract awarded to Ets-Hokin & Galvan, $8,976.

Fresno County—At the new district office at the corner of West and Olive Avenues. Construct an irrigation pipe line and a reinforced concrete diversion box. Contract awarded to Thomas Construction Co., $8,013.94.

Fresno County—FAS 808—Between State Route 138 and Sacramento Avenue, from Coalinga easterly. Construct a graded roadbed, place imported base material, plant-mixed surfacing on cement treated base, apply seal coat and construct a reinforced concrete bridge across Jacalitos Creek, 5.0 miles. Contract awarded to Granite Const. Co., $185,651.

Humboldt County—US 299—Between 3.5 miles east of Blue Lake and 1.0 mile west of Willow Creek. Install drainage facilities. Contract awarded to Mercer Fraser Co. and Mercer Fraser Gas Co., Inc., $13,882.

Humboldt County—SR 36—About 15.5 miles east of US 101. Place selected rock as embankment protection on existing roadway slopes, 0.1 mile. Contract awarded to Mercer Fraser Co. and Mercer Fraser Gas Co., Inc., $3,950.

Inyo County—At Shoshone Maintenance Station. Construct a cottage. Contract awarded to M. G. Swingrover, $12,750.

Los Angeles County—In the City of West Covina, on the Ramona Freeway between the west city limits and 0.3 mile east of Citrus Avenue. Grade and pave with portland cement concrete and seven bridges to be constructed, 4.2 miles. Contract awarded to Winston Bros. Co., $2,812,322.

Los Angeles County—US 101 Alt.—Between 0.1 mile east of Corral Canyon and 0.1 mile west of Malibu Creek, about 11 miles northwest of the City of Santa Monica. Construct a graded roadbed; surfacing with plant-mixed surfacing on untreated rock base, construct right and left turn lanes; perform erosion control and preparatory landscaping and install traffic signal and highway lighting system, 0.7 mile. Contract awarded to Schroeder & Company, $85,999.90.

Marin County—FAS 608—On Sir Francis Drake Boulevard at Devil Gulch about 2 miles south of Tocaloma. Extend the existing concrete arch culvert and grade, place plant-mixed surfacing on a portion of the roadbed. Contract awarded to E. A. Forde Co., $14,772.75.

Merced County—SR 33—Across Arroyo Canal near Dos Palos. Construct a reinforced concrete curbing and metal beam bridge railing on the existing bridge. Contract awarded to Thomas Construction Co., $4,843.20.

Orange County—On Harbor Boulevard, about 0.5 mile east of Anaheim. Grading ramps, frontage roads and connections and surfacing them with plant-mixed surfacing on untreated rock base and construction of a welded plate girder bridge of four spans supported on reinforced concrete piers and abutments on concrete pile foundations, completion of which provides a new overcrossing with ramps, frontage roads and connections. Contract awarded to J. A. Thompson & Son, $374,511.20.

Riverside County—At Indio Maintenance Station. Grade and surface a portion of the maintenance yard, construct new fence and relocate existing fence. Contract awarded to Meredith & Simpson, $7,121.55.

Sacramento County—US 99—Between 0.5 mile south of Elk Grove Road and 1.8 miles south of Florin Road. Construct a graded roadbed for northbound traffic lanes and pave with portland cement concrete on cement treated subgrade, widen and surface the existing highway for the southbound traffic lanes with plant-mixed surfacing and grade and surface frontage roads with plant-mixed surfacing and construct six bridges, completion of which provides a four-lane divided highway with reinforced concrete overcrossings at Elk Grove Road and Sheldon Road and reinforced concrete bridges at Elk Grove Creek, Laguna Creek, Whitehouse Creek and at Strawberry Creek, 5.1 miles. Contract awarded to Granite Construction Co., $1,513,047.

Sacramento County—US 50—At the intersections of Folsom Boulevard with 43d Street and with 60th Street. Install fixed-time, interconnected traffic signal and highway lighting systems at two locations. Contract awarded to Grason Electric Co., $8,207.

San Benito County—FAS 1193—Across Tres Pinos Creek about 18 miles southeast of Hollister. Construct a reinforced concrete bridge across Tres Pinos Creek and one across Tres Pinos Creek (Stoddart Bridge). Contract awarded to G. C. Renz Construction Co., $29,723.

San Bernardino County—At the intersection of Central Avenue with Texas Street. Install in place a semi-traffic-actuated signal system and highway lighting. Contract awarded to E. Eggers Company, $7,390.

San Bernardino County—SR 190 and 207—Between Route 207 and Baseline Avenue about 2 miles north of Redlands, 1.6 miles. Construct a graded roadbed and place plant-mixed surfacing on imported base material and on existing surfacing, completion of which provides a four-lane divided highway. Contract awarded to Matich Bros., $183,894.30.

San Diego County—At the intersection of Main Street and El Cajon Boulevard. Surface the existing intersection with plant-mixed surfacing on imported base material. Contract awarded to Sim J. Harris, $3,003.50.

San Francisco County—Bayshore Freeway, at the Vermont Street Off-Ramp at Mariposa Street, 0.2 mile. Grade the Off-Ramp Roadway and surface with plant-mixed surfacing on cement treated base. Contract awarded to Chas. L. Harney, Inc., $28,741.55.

San Mateo County—SR 1—Across San Pedro Creek about 8 miles south of Junction of Routes 55 and 56. Construct a reinforced concrete bridge, construct a detour and grade approaches. Contract awarded to Thomas Construction Co., $38,539.50.

San Joaquin and Contra Costa Counties—SR 4—Across Old River, about 17 miles west of Stockton. Remove damaged timber and piling in the existing rest pier fender and replace with new materials. Contract awarded to H. F. Lauritzen, $4,635.

Santa Barbara County—FAS 1181—On Hollister Avenue between 1.6 miles west of Fairview Avenue in Goleta and Ellwood Overhead. Grade shoulders on portions of the project and construct a graded roadbed on the remainder of the project, construct cement treated base, placing plant-mixed surfacing over existing pavement and newly constructed cement treated base and apply seal coats, 2.9 miles. Contract awarded to Baker & Pollock, $101,679.40.

Santa Clara County—SR 17—Between 0.5 mile south of Los Gatos and Roberts Road. Construct a graded roadway and a lined channel; placing plant-mixed surfacing on cement treated base and untreated rock base; applying penetration treatment and seal coats and construct five bridges completion of which provides a new freeway with a reinforced concrete undercrossing at Santa Cruz Avenue; reinforced concrete bridge at Los Gatos Creek; steel overcrossing at the Los Gatos School for pedestrians; steel bridge at Los Gatos Creek and a steel utility crossing at Los Gatos Creek, 2.1 miles. Contract awarded to L. C. Smith Co., $1,198,516.61.

Solano County—SR 12—At Station 443+25 in and near Fairfield. Revise the existing drainage facilities. Contract awarded to John H. McCosker, Inc., $3,582.

Stanislaus County—SR 33—Between 1.8 miles south of San Joaquin County line and Newman, 12.3 miles. Place plant-mixed surfacing over the existing pavement and construct untreated rock base shoulders. Contract awarded to Clements Const. Co., $57,229.

Stanislaus County—SR 109—At Modesto Irrigation District Lateral No. 3 near Modesto. Place a reinforced concrete pipe culvert grade and pave with plant-mixed surfacing on untreated rock base. Contract awarded to Friant Construction Co., $14,471.

DECEMBER, 1954

Alameda County—US 40—Between south of University Ave. and El Cerrito Overhead. Grade roadbeds and frontage roads, interchange ramps and detours, construct portland cement concrete pavement on cement treated subgrade, place plant-mixed surfacing on cement treated base and untreated rock base; construct traffic controls, highway lighting and two reinforced concrete bridges, completion of which provides an eight-lane divided highway with a University Ave. Overcrossing and a Gilman St. Undercrossing, 1.9 mile. Contract awarded to Stolte, Inc.-Gallagher & Burk, Inc., Oakland, $2,040,720.45.

Colusa County—SR 16—Across Bear Creek about 25 miles west of Williams. Repair bridge by replacing the existing timber truss span with a new structural steel stringer span. Contract awarded to R. E. Hertel, Sacramento, $11,760.

Contra Costa County—SR 24—Near Pittsburg, at the intersections of Arnold Industrial Highway with Bailey Road and with Somersville Road. Construct additional roadway width for storage lane by placing plant-mixed surfacing on untreated rock base, remove existing flashing beacons and install a three-phase full traffic-actuated signal system and flashing beacon system at two intersections. Contract awarded to Hall-Sloat Electric Co., Inc., Oakland, $34,965.

Fresno County—US 99—Between Clinton Ave. and the intersection of Weber and W. Weldon Ave. Grade bridge approaches and place plant-mixed surfacing on untreated rock base and construct a steel bridge, 0.5 mile. Contract awarded to Gene Richards, Inc., D. M. Underdown and Gene Richards, Fresno, $221,020.40.

Fresno County—US 99—At various locations on US 99 in the City of Fresno. Remove portions of existing pavement and replace with plant-mixed surfacing on portland cement concrete base and apply seal coats to existing pavement at other locations, 0.5 mile. Contract awarded to Thomas Construction Co., Fresno, $13,856.50.

Fresno County—FAS 810—Between Howard Ave. and Garfield Ave. Construct a graded roadbed and surface with plant-mixed surfacing on cement treated base, construct three bridges and extend an existing culvert, providing bridges at Crescent Canal, North Fork Kings River Overflow, and North Fork Kings River, 5.5 miles. Contract awarded to C. K. Moseman, Redwood City, $370,218.

Humboldt County — SR 96 — Between Willow Creek and Weitchpec. Install reflectorized guide posts. Contract awarded to Wulfert, Company, Inc., San Leandro, $28,955.50.

Imperial County—SR 80—Across Colorado River at Yuma, Ariz. Construct a bridge and one approach embankment with surcharge. Contract awarded to Fred J. Early, Jr., Co., Inc., San Francisco, $1,236,765.

Inyo County—US 395—Between 3 miles north of Cottonwood Creek and Diaz Lake, about 3 miles south of Lone Pine. Construct graded roadbed and surface with plant-mixed surfacing on untreated base, 7.6 miles. Contract awarded to C. V. Kenworthy, Stockton, $237,958.10.

Inyo County—FAS 1184—Between Junction State Route 76 about 1.8 miles north of Bishop, and Jean Blanc Road. Grade and surface with bituminous surface treatment of imported base material, 1.7 miles. Contract awarded to Bishop Engineering & Const. Co., Bishop, $54,402.68.

Kern County—SR 140—Between 1.4 miles north of Taft and Weed Creek. Construct a graded roadbed and place plant-mixed surfacing on cement treated base, completion of which provides a roadway on new alignment, 2.3 miles. Contract awarded to Griffith Company, Los Angeles, $160,859.50.

Kern and Tulare Counties—US 99—Between 1 mile south of Delano Underpass and 0.5 mile north of Kern-Tulare County line. Grade roadbeds and place portland cement concrete pavement, grade ramps, approaches and frontage roads and place plant-mixed surfacing and construct six bridges, completion of which provides a four-lane divided highway with an Airport Road Overcrossing, 11th Ave. Overcrossing, Fourth Ave. Overcrossing, Route 136-4 Separation, North Delano Overhead, and the County Line Overcrossing, 4.0 miles. Contract awarded to Gordon H. Ball and San Ramon Valley Land Co., Danville, $1,908,844.11.

Los Angeles County—SR 39—Across Little Dalton Wash. Construct a steel pedestrian bridge. Contract awarded to Monterey Construction Co., El Monte, $3,200.

Los Angeles County—US 101—Between Pioneer Blvd. and east of Rosecrans Ave. Prepare areas and plant ground cover plants and trees, 2.1 miles. Contract awarded to K. E. C. Co., Long Beach, $27,754.

Los Angeles County—Long Beach Freeway, between 223d St. and Atlantic Ave. Prepare areas and plant ground cover plants and trees, 4.6 miles. Contract awarded to Henry C. Soto Corp., Los Angeles, $46,151.

Los Angeles County—At the intersections of Lakewood Blvd.-Rosemead Blvd. with Imperial Highway, Washington Blvd., Whittier Blvd., Beverly Blvd., Mission Drive and California St. Modify the existing traffic signal systems and highway lighting and modify or reconstruct channelization. Contract awarded to Fischbach & Moore, Inc., Los Angeles, $52,527.

Los Angeles County—At the intersections of Manchester Blvd. with Hillcrest Blvd. and with La Brea Ave., in the City of Inglewood. Install highway lighting and modify the existing pre-timed signal systems. Contract awarded to Electric & Machinery Service, Inc., South Gate, $9,190.

Los Angeles and Orange Counties—Across Coyote Creek Flood Control Channel at Carson St. and Norwalk Blvd. Construct two steel bridges and approaches at Coyote Creek at Carson St. and at Coyote Creek at Norwalk Blvd., 0.9 mile. Contract awarded to Basich Bros. Const. Co., R. L. Basich, N.L. Basich and O.B. Pierson, Garvey, $480,978.90.

Los Angeles County—FAS 833—Between the south city limits of Palos Verdes and Narcissa Dr. Construct a graded roadbed and surface with plant-mixed surfacing on untreated rock base and imported base material, 3.6 miles. Contract awarded to Tomei Const. Co., Van Nuys, $354,040.85.

Lake County—FAS 1043—Between Scotts Creek Bridge and 1.6 miles northerly, about 2 miles west of Lakeport. Construct a graded roadbed, place imported base material and apply seal coat, 1.6 miles. Contract awarded to Lange Bros., Lakeport, $24,579.60.

Marin County—US 101—Between Manzanita and Golden Gate Bridge. Place plant-mixed surfacing on cement treated base, tile the tunnels, install highway lighting, illuminated signs and tunnel lighting, 3.7 miles. Contract awarded to A. G. Raisch Co., San Rafael, $1,192,952.98.

Mendocino County—US 101—Between Reeves Creek and 0.9 mile north of Hilvilla. Construct a graded roadbed and surface with plant mixed surfacing on cement treated base, completion of which provides a four-lane roadway on new alignment, eliminating curves. Contract awarded to Fredrickson Bros., Emeryville, $579,796.05.

Mendocino County—US 101—At the intersection of Main St. with Commercial St. in the City of Willits. Install a semitraffic-actuated signal system and highway lighting. Contract awarded to L. H. Leonardi Electric Const. Co., San Rafael, $7,375.

Merced County—At the intersections of Bennett Rd. and V St. with US 99 in the City of Merced. Install traffic signal system and highway lighting. Contract awarded to Industrial Electric Co., Modesto, $6,541.

Monterey County — SR 120 — At San Vicente School. Prepare shoulders on the existing roadway and apply road-mixed surfacing, 0.2 mile. Contract awarded to Bickmore-Harper, Inc., Santa Maria, $1,547.50.

Napa County—FAS 824—Between Trancas Ave. and Silverado Trail. Construct a graded roadbed and surface with untreated rock base and seal coat, completion of which provides approaches to a future bridge, 0.4 mile. Contract awarded to Friant Const. Co., Fresno, $59,815.85.

Riverside County—US 60, 70, 99—In the City of Banning, at the intersection of Ramsey St. and San Gorgonio Ave. Install complete in place, a full traffic-actuated signal system. Contract awarded to Paul R. Gardner, Ontario, $8,899.

Sacramento and Placer Counties—US 40—Between Ben Ali and 0.5 miles east of Roseville. Place cement treated and untreated base and surface with plant-mixed surfacing. Grade portions of east and west bound roadways. Grade and surface connection roads and approaches. Construct drainage, traffic control devices, completion will provide four-lane divided highway on new alignment, 13.1 miles. Contract awarded to Baldwin Contracting Co., Inc., Marysville, $1,576,913.05.

Sacramento County—SR 24—Between Sacramento River Bridge near Isleton and 2 miles south of Freeport. Install guide posts, salvage and reset guide posts, reflectorize the existing guide posts and install metal plate guard railing. Contract awarded to Charles I. Cunningham, Oakdale, $6,449.50.

Sacramento County—At the warehouse site on Folsom Blvd. near 59th St. Grade and surface hardstand and storage areas and construct a metal building, construct a drop inlet and slip joint, place imported subbase material, untreated base, plant-mixed surfacing and apply seal coat. Contract awarded to Brighton Engineering Co., Perkins, $18,744.70.

San Bernardino County — At Eighth St. and Southern Pacific Railroad Crossing in the City of Colton. Completion of this contract will provide a steel bridge at Eighth St. Underpass, a concrete bridge at Eighth St. Underpass, a concrete bridge at J Street Off-ramp Undercrossing, and approaches constructed by grading and surfacing with plant-mixed surfacing on cement treated base and existing pavement, 0.2 mile. Contract awarded to R. M. Price Co., Altadena, $540,309.70.

San Bernardino County — FAS 710 — Between Waterman Ave., the east city limits of San Bernardino, and Palm Ave., on E. Ninth St. Construct a graded roadbed, place plant-mixed surfacing on local material, imported base material and on existing pavement and apply seal coats, 4.0 miles. Contract awarded to R. A. Erwin, Colton, $215,896.20.

San Diego County—US 101—At Camp Pendleton main entrance, about 0.1 mile north of Oceanside. Provide a reinforced concrete bridge at Camp Pendleton Undercrossing, with grade separation, ramps and frontage roads, surfaced with plant-mixed surfacing on imported base material and portland cement concrete base. Contract awarded to R. E. Hazard Contr. Co. and W. F. Maxwell Co., San Diego, $349,760.15.

San Diego County—US 101—Between Miramar Rd. and Torrey Pines Grade. Construct earth berms, fill side gutters, construct guard railing and remove and trim trees, finish roadway, apply penetration treatment and place plant mixed surfacing, 2.3 miles. Contract awarded to Milleman Sooy & Jackson, Redlands, $42,906.

San Diego County—US 101—At 0.1 mile south of south city limits of Carlsbad and on the San Luis Rey River Bridge. Install illuminated sign standards and electrical equipment. Contract awarded to Ets Hokin & Galvin, San Diego, $4,411.

San Joaquin County—US 99—Between Turner Station and Kingsley Rd. Construct a graded roadbed for northbound traffic lanes and pave with portland cement concrete on cement treated subgrade and grade and surface frontage roads with plant-mixed surfacing on untreated base and construct concrete bridges, compleiton of which provides a new four lane divided highway with two separated and parallel bridges at French Camp Slough, at Lone Tree Slough and at Little John Creek, 3.4 miles. Contract awarded to A. Teichert & Son, Inc., Sacramento, $727,570.50.

San Mateo County—US 101—At the intersection of El Camino Real and Howard Ave., in the City of San Carlos. Install a two-phase full traffic-actuated signal system with pedestrian actuation equipment and highway lighting. Contract awarded to L. H. Leonardi Electric Const. Co., San Rafael, $12,718.

San Mateo County—Bayshore Freeway, approximately 1,500 feet northerly of Butler Road Overcrossing. Construct scale house improvements and channelization. Contract awarded to Love & Haun, San Francisco, $2,713.

Santa Barbara County—US 101—Between 1 mile east of Carpinteria and 0.5 mile east of Arroyo Parida. Prepare ground and plant cover plants, trees and shrubs, 3.4 miles. Contract awarded to Justice-Dunne Co., Oakland, $24,101.60.

Santa Barbara County—US 101—At the intersection of US 101 with Fairview Ave., about 5½ miles west of Santa Barbara. Widen the existing roadway by placing imported subbase, imported base and untreated rock base, surfacing with plant-mixed surfacing and apply seal coats, 0.4 mile. Contract awarded to Bickmore-Harper, Inc. and Contractors Equipment Rental Service, Santa Maria, $31,816.

Santa Clara County—US 50—Between 0.1 mile south of Moorpark Ave. and Scott St., near San Jose. Widen the existing highway and surface the widened areas with plant-mixed surfacing on cement treated rock base, place plant-mixed surfacing on the frontage road and furnish and install traffic signal system. Contract awarded to Edward Keeble, San Jose, $37,600.

Santa Clara County—FAS 999—Across Stevens Creek, on Homestead Road, about 5 miles west of Santa Clara. Completion of this contract provides a four-lane roadway width, by widening the existing bridge with reinforced concrete slab construction. Contract awarded to Carl N. Swenson Co., Inc., San Jose, $56,755.30.

Santa Clara County—FAS 1002—Across Stevens Creek on Fremont Ave. between Burns Ave. and Mercedes Ave. Widen the existing bridge and approaches. Contract awarded to Lew Jones Const. Co., San Jose, $64,736.25.

Shasta County—US 99—Between 0.5 mile north of Pit River Bridge and Sidehill Viaduct. Construct a passing lane on existing roadway with plant-mixed surfacing on untreated base, 0.3 mile. Contract awarded to Morgan Construction Co., Redding, $4,990.

Shasta County—US 99—Between Mountain Gate and Bass Hill. Grade roadbeds, place plant-mixed surfacing on cement treated base, grade ramps, approach and frontage roads and place plant mixed surfacing on untreated base, completion of which provides a four-lane divided highway on new alignment with approaches and frontage roads, 2.9 miles. Contract awarded to Fredrickson & Watson Const. Co., Oakland, $785,555.55.

Sonoma County—US 101—At the intersection of Santa Rosa Freeway with Steele Lane, approximately 0.6 mile north of northerly city limit of Santa Rosa. Intall three-phase traffic-actuated signals and advance

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ROD RICHARDSON

Continued from page 59 . . .

inally employed in banking, he entered the accounting field, following service in the Marine Corps during World War II. Immediately prior coming to Sacramento, he was Director of Employee Relations for U. S. Rubber Company at Los Angeles.

In Sacramento he was active in community affairs, directing public relations activities for the American Red Cross, Sacramento County Heart Association, American Cancer Society, Mercy Hospital Expansion Fund, and Sacramento County Crippled Children's Society, among others. He was recently elected as President of Sacramento Chapter 2 for 1955, the largest single unit of the California State Employees' Association, with a membership of over 8,000 in this part of the State. He is also an active member of the Public Relations Society of America and belongs to the Press and Union League Club of San Francisco.

The Benmatt Organization is a metal fabrication manufacturing firm with wholesale and retail outlets all over the North American Continent. Richardson's election is part of a program of expanded operations that will be initiated in 1955, and his duties will be those of an executive assistant to the president, with managerial responsibility in production operations, merchandising, fiscal control and public relations.

In Memoriam

LUTHER ORR STEPHENS

Luther Orr Stephens, 50, Associate Highway Engineer with the Division of Highways, passed away in his home in Sacramento on January 11, 1955, after an illness of several months.

Stephens first came to work for the State in 1928 as a draftsman in the District III office, at that time in Sacramento. He subsequently served in District II at Redding, District IV at San Francisco and District IX at Bishop, transferring to the office engineer's section of the headquarters office at Sacramento in 1935. He had been in the Design Department since 1949.

Stephens was born in St. Louis, Missouri, and studied engineering at Sacramento Junior College and the University of California at Berkeley.

From 1925 to 1928 he worked for the Sacramento County Surveyor's Office.

Stephens was a member of the California State Employees Association and Sacramento Lodge 40, F. & A. M. He was one of the organizers of the Public Works Athletic Association and was its president for many years.

He is survived by his wife, Beryl; a son, Earl Orr, Sacramento; and his mother, Mrs. Marie Marraw, Sacramento.

TRIPLE THREAT DRIVERS

Are you a triple threat driver? The California State Automobile Association says you are if you get out of your automobile on the side toward traffic. By so doing you endanger yourself, you risk having your car smashed up, and you also run the hazard of causing other drivers to become involved in a chain-reaction smashup, with several cars involved and a good chance that someone will lose his life.

New Honor for George T. McCoy

G. T. McCoy, State Highway Engineer, has been elected Western District Vice President of the American Road Builders Association for 1955. He succeeds Harmer E. Davis, Director of the Institute of Transportation and Traffic Engineering of the University of California.

The new president of A. R. B. A., announced at the organization's annual convention held in New Orleans in January, is J. N. Robertson, Director of Highways of the District of Columbia. The immediate past president is Robert M. Reindollar of Baltimore, Md.

Other Californians elected by the association for 1955 include T. W. Switzer of Visalia, Road Commissioner of Tulare County, as district vice president for the county and local roads division; and Bob Glenn of the I. T. T. E. staff of the University of California, as district vice president of the educational division.

CONTRACTS AWARDED

Continued from page 61 . . .

warning flashing beacon and construct channelization. Contract awarded to E. A. Forde Co., San Anselmo, $28,955.50.

Sonoma County—SR 12—At Bisso's Corner about 1.6 miles south of the City of Sonoma. Construct a superelevated shoulder and traffic lane on the existing curve with plant-mixed surfacing on untreated base and imported borrow, 0.2 mile. Contract awarded to I. J. Ely Co., Larkspur, $8.627.25.

Stanislaus County—SR 120—Between the San Joaquin county line and 1 mile north of Oakdale. Construct a graded roadbed and place plant-mixed surfacing on untreated rock base, 3.5 miles. Contract awarded to M. J. Ruddy & Son, Modesto, $213,111.14.

Tuolumne County—SR 108—At 0.5 mile east of Twain Harte. Grade and pave with plant-mixed surfacing on untreated rock base and imported subbase, 0.2 mile. Contract awarded to Beerman & Jones, Sonora, $15,133.

GOOD VISION NEEDED

About 90 percent of all the actions a driver must take are based on messages received through his eyes. Many persons who have normal vision by daylight are not able to see equally well at night. As a driver ages, his resistance to glare decreases and while he may have normal night vision for his age, glare from oncoming headlights will affect him more seriously than it would a younger person.

HIGHWAY COMMISSION APPOINTMENTS BY GOVERNOR

H. STEPHEN CHASE

FRANK B. DURKEE

FRED W. SPEERS

Governor Goodwin J. Knight in January announced the retention in office of Director of Public Works Frank B. Durkee, reappointed H. Stephen Chase of Sacramento as a member of the California Highway Commission, and appointed Fred W. Speers, newspaper publisher of Escondido, to succeed Charles T. Leigh, San Diego, whose term on the commission had expired. Durkee is chairman of the commission by virtue of his position of Director of Public Works.

Chase was appointed on the Highway Commission by Governor Earl Warren in November, 1951, succeeding the late Homer P. Brown of Placerville who resigned because of ill health.

Chase, who is vice president and manager of the American Trust Company and a director of the California Western States Life Insurance Company, was born in San Jose in 1903, educated in the public schools there and was graduated from Stanford University and from the Harvard University School of Business Administration.

He went to work for the American Trust Company in 1927 after his graduation from the business school. He worked in branches of the bank in San Francisco, San Jose, Redwood City and Santa Rosa, before his transfer to Sacramento in 1940.

Chase also has been active in community affairs, including service as chairman of the California War Chest campaign in 21 Northern California counties during World War II. He also has aided the Community Chest, Red Cross and other civic activities.

Speers is co-publisher with H. R. McClintock of the *Daily Times-Advocate* and the weekly *Times-Advocate* of Escondido.

He has been president since April, 1954, of the Palomar Savings & Loan Association of Escondido and a member of its board since its founding in 1951; is a director, La Jolla-San Diego County Theatre and Arts Foundation, a former member of State Advisory Council, California Newspaper Publishers Association, and secretary since 1950 of Republican County Central Committee of San Diego County. He has been director of Escondido Chamber of Commerce for past three years. Speers is a Major, Air Force Reserve. He served on Tinian in the Marianas during World War II with Sixth Bombardment Group. He is holder of the Bronze Star, Air Medal, four battle stars and qualified as both combat and counterintelligence officer. Prior to coming to California in May, 1947, he had been publisher from 1937 to 1946 of the North Platte (Neb.) *Daily Bulletin*. He graduated at Stanford University (A.B. in history) June, 1928. He had attended Davenporr, Iowa, high school. He was born there July 26, 1906, and married October 12, 1935, to former Victoria Rountree, a law graduate at Cornell University at Ithaca, who has been admitted to practice in New York and Florida. Both were members of the party of 16 American newspaper people who visited Russia, Poland and Czechoslovakia in spring of 1954.

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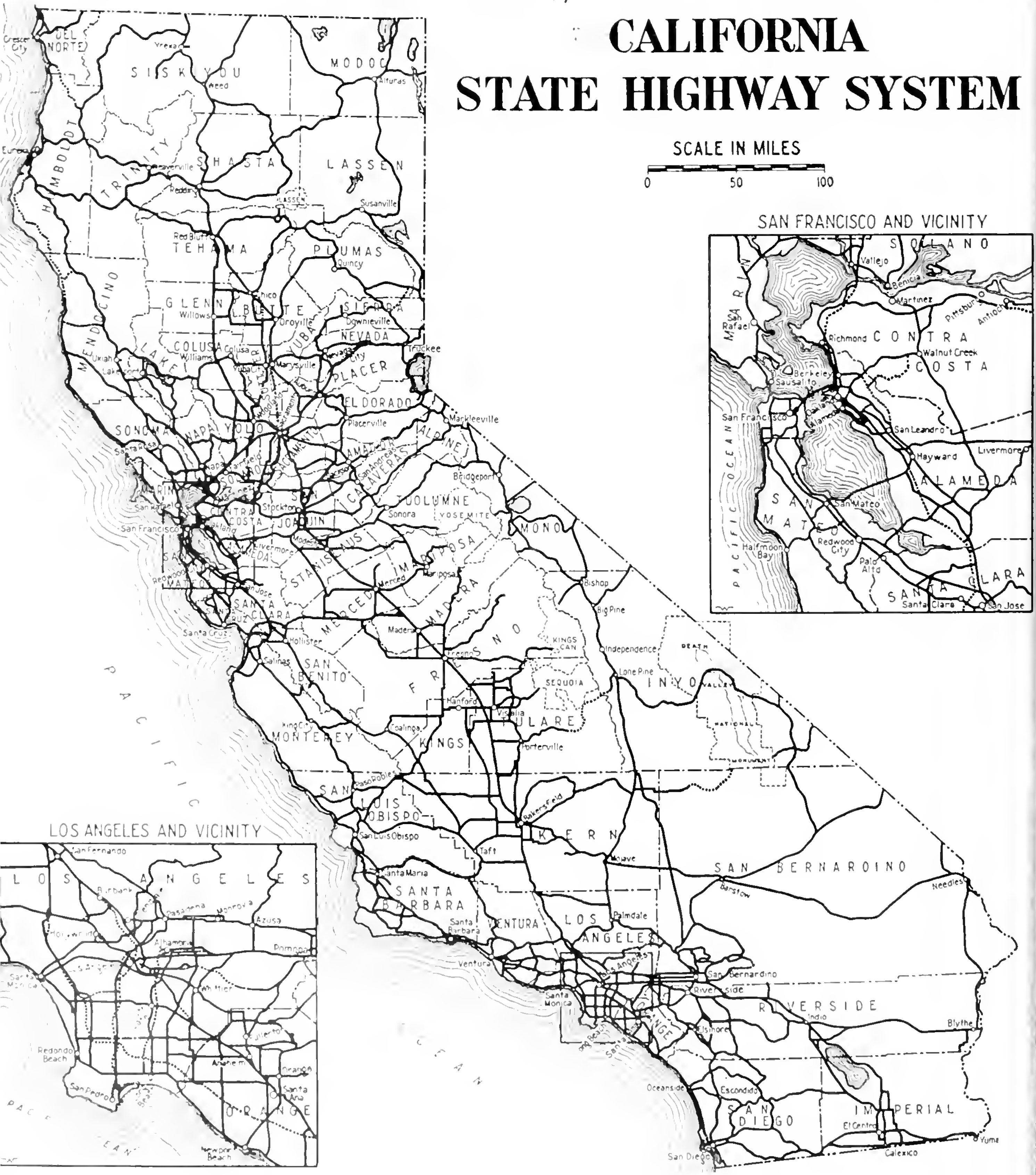

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MERRITT R. NICKERSON, *Chief Photographer*

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Sacramento, California

District IV Freeways Make Great Strides

By B. W. BOOKER
Assistant State
Highway Engineer

Developments During The Past Year

THE MARCH-APRIL, 1954, issue of *California Highways and Public Works* reported on the strides which had been made in the construction of freeways in the metropolitan area which surrounds San Francisco Bay. While the groundwork for California's freeway system was laid through enabling legislation which was enacted in 1939, the evidence of the accomplishments which have unfolded from this program became apparent only recently.

The accelerated construction of these facilities through the postwar period now is rapidly being expanded into long avenues of modern highways as the initial short stretches of freeway continue to be linked into connected thoroughfares.

Substantial Results

The past 12 months period has produced substantial results in the development of a system of freeways in District IV measured in mileage, expenditures and other terms. One year ago a total length of 140.5 miles of freeways and expressways were carrying traffic in District IV. Since that time an additional 18.1 miles were completed and it is noteworthy that all but 2.3 miles of the additional length were initially constructed to full freeway standards.

The role which these state highway facilities play in helping to solve the transportation problems of a major metropolitan area is significant. In 1951 the San Francisco Planning Commission adopted a trafficways plan as the transportation section of their master plan. The text of this plan, in part, states:

"The trafficways plan of San Francisco is designed as a guide for the attainment to the greatest degree possible of the following objectives:

"1. Adequate provision for the expeditious, convenient and safe movement of vehicular traffic, including rubber-tired public transit vehicles where appropriate, between all neighborhoods, community areas, and working areas of the city, and the gateways leading into and out of the city.

"2. Development of an efficient, economical and balanced system of major trafficways consisting of freeways, major thoroughfores, and secondary thoroughfares, each employed where it is most suitable and effective from the standpoint of present and prospective traffic movement and from the standpoint of the present and desirable future use and development of adjoining land areas.

"3. Coordination of the trafficways system with related transportation plans and facilities of other categories, especially public transit, as well as with other related features and facilities of land development provided for in other sections of the 'master plan.' "

City Planning Report

The San Francisco Department of City Planning in its annual report dated January, 1955, makes the following comment concerning progress on the trafficways:

"Closely related to the city-wide land use plan is the trafficways plan. Adopted July 17, 1951, by the City Planning Commission, it is now beginning to take shape in a rather spectacular manner, through projects being built by the city as well as others being constructed by the California State Division of Highways. Bayshore Freeway, a state project, now nearing completion for its entire length, is adding a new feature to the character of the city.

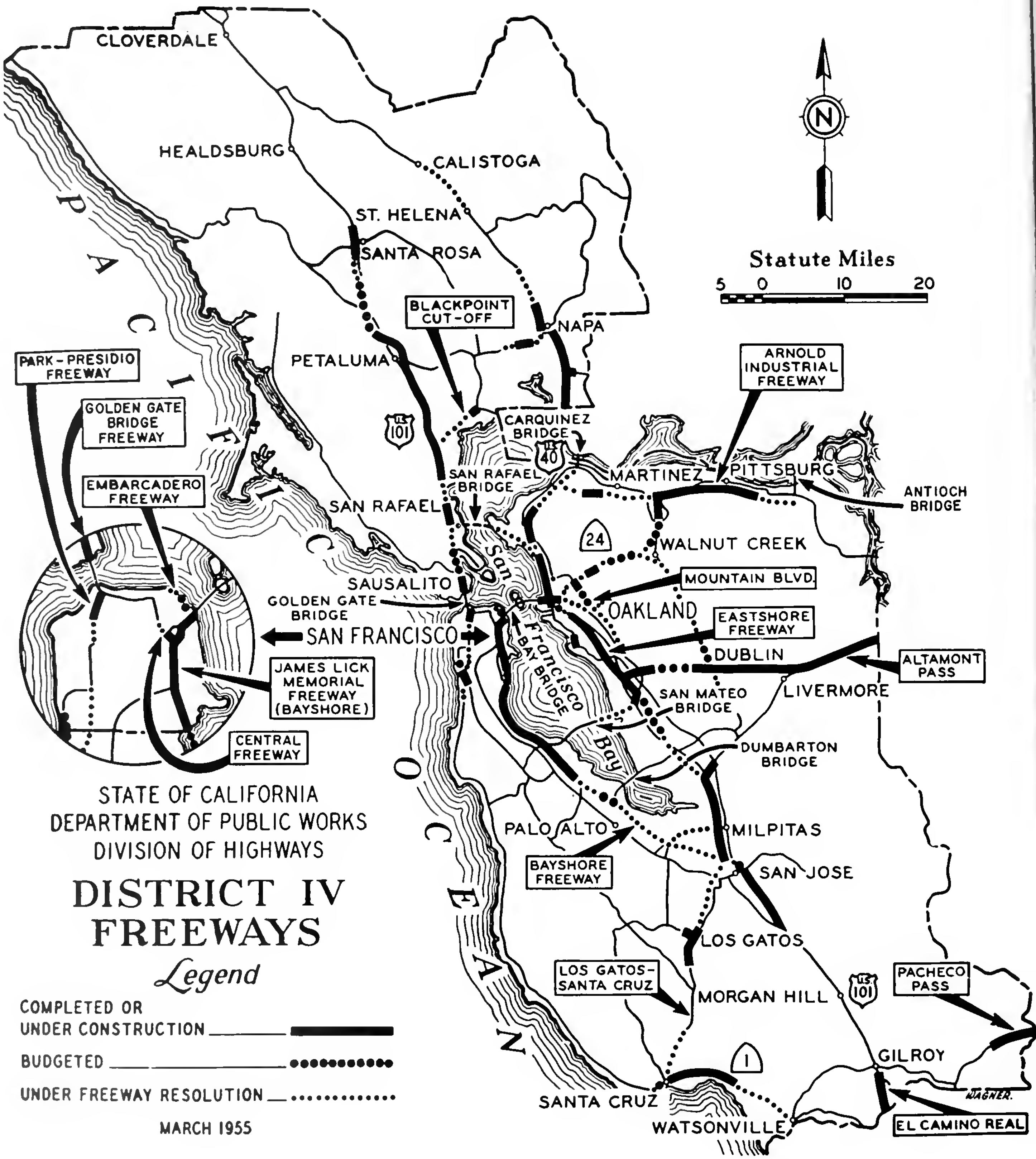
"A national award was recently granted the State Division of Highways for the design of its 'skyways' in the complex 'over and under' pattern of viaducts at the junction of the Bayshore, Central and Embarcadero Freeways with the Bay Bridge in the South-of-Market area. The state engineers have opened up new vistas that can be seen by motorists from these new viaducts, a panorama of imposing city skyscrapers developing with breathtaking suddenness.

Bayshore Freeway Costs

Construction and right of way costs for the 6.4 miles of the Bayshore Freeway in San Francisco come to a total of approximately $39,832,000, of which over $20,000,000 were for the acquisition of rights of way. Total length of structures is approximately 8.4 miles. San Franciscans using this artery can now report average daily time savings of from 10 to 25 minutes per trip. Benefits have likewise accrued to users of thoroughfares formerly carrying traffic now using the freeways. The choking peak hour congestion is gone, and abutting property owners are benefiting from a chance of easier access and less noise."

The annual report of the City Planning Commission of Oakland dated September 8, 1954, also comments on the contribution made by freeway construction in that city. The report states:

"Adopted in 1948, the freeways and major streets section of the master plan sets forth a 20-year program for meeting the needs of the automobile age. The plan provides a well-knit pattern of traffic arteries designed as the framework of the city's circulation system. Since adoption, notable progress has been made in translating the plan into reality.



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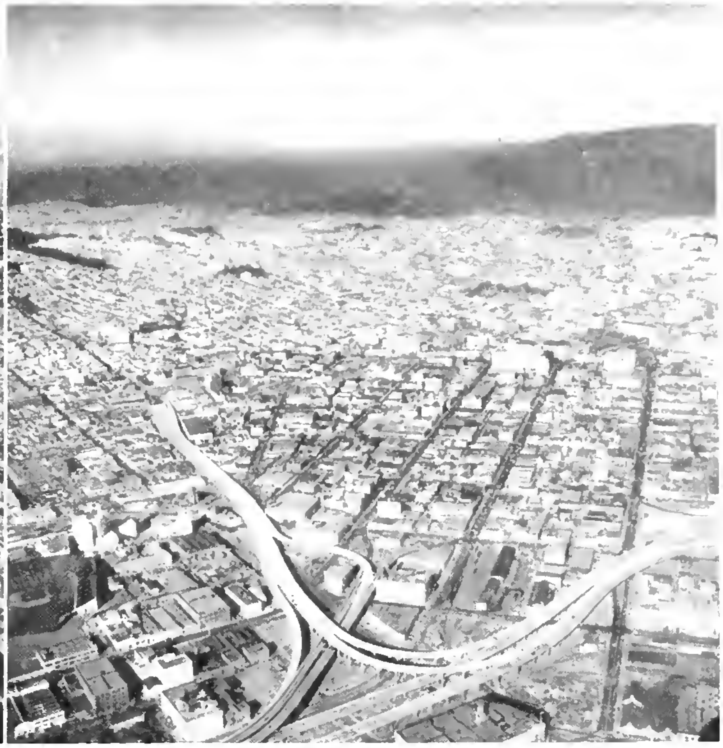


LEFT—Division Street Interchange on Bayshore Freeway in San Francisco showing progress of construction on final units of the freeway which will connect with the Bay Bridge approach in the center right of the picture. RIGHT—Looking westerly along the initial unit of the Central Freeway in San Francisco from its junction with the Bayshore Freeway at the Division Street interchange to its present terminus at 13th and Mission Streets.

"A major traffic bottleneck was substantially relieved with the rerouting of Eastshore Freeway traffic from Seventh and Eighth Street to Fifth and Sixth Streets between Oak Street and Market Street. This was accomplished by the construction of bridges over the Posey Tube approach. These bridges will later serve as on and off ramps for the elevated freeway."

Elevated Roadways

The engineering achievement in providing an artery of high utility from a traffic standpoint has also added to the aesthetic qualities of the metropolis. The elevated roadways of the freeway in San Francisco afford motorists an excellent opportunity to view the splendor of her world famous skyline as they approach the central district of the city. The magnificence of the view has appropriately led to the local designation of the elevated freeway system as "skyways."

To complement the beauty of the vista from the roadway of the skyway structures the construction has attained distinction in yet another manner. The unit of the viaduct first to be finished which terminated with ramps connecting to Ninth and Tenth Streets at Bryant Street was judged by the American Institute of Steel Construction to be the most beautiful Class II steel bridge opened in 1954. This award was on the occasion of an annual nation-wide competition which includes bridges costing over $500,000 and having no span over 400 feet.

Forty-five Contracts Under Way

As of March 1, 1955, District IV had a total of 45 construction contracts under way which represent a construction cost totaling $62,300,000. A number of these projects cover improvements of a conventional highway type including those which are minor in scope. However, 26 of the jobs are for construction of full freeways on an additional 41.0 miles of modern facility at a cost of $58,764,000.

With the revenue now anticipated, financing is provided for construction and acquisition of right of way totaling $60,893,000 in District IV during the 1955-56 Fiscal Year. Of this amount, $57,170,000 has been allocated for freeway type improvements. Thus in the Bay area, in excess of 90 percent of the current and programmed funds have been and will continue to be expended for freeway development.

The accompanying map illustrates how the freeway routes are encircling the Bay and are radiating out from the metropolitan area to the north, east and south. The development of these routes together with the six existing bridges and with the Richmond-San Rafael Bridge now under construction, is gradually contributing to the breaking of the barrier imposed by the geography of the Bay area. At the same time progress on this combination of facilities is adding to the convenience and safety for large volumes of traffic in their movement between residential and occupational centers of the region as well as for other users whose needs are served by a highway transportation system.

The items which follow cover highlights of the progress during the past

12 months in the development of a system of freeways in District IV, together with information concerning future projects for which financing has been provided:

BAYSHORE FREEWAY

An important unit of the Bayshore Freeway in San Francisco between Sixteenth and Seventh Streets was placed into service when the northbound lanes were opened on July 20, 1954, followed by opening of the southbound lanes on August 27, 1954. The roadways are carried on elevated structures of all-welded steel construction similar in design to the adjacent award-winning section of the skyway.

As the previously completed section of the freeway concentrated the bulk of the traffic on the on and off ramps connecting with Bryant Street at Tenth and Ninth Streets, the new section materially relieved the congestion on the terminal ramps and clearly indicated that further freedom of movement could be anticipated as ramps on subsequent sections are made available. The work on this 0.7-mile project was done by the Guy F. Atkinson Company at a cost of $3,230,000.

Immediately east of the finished portion, work is nearing completion on two subsequent contracts. The unit from Eighth Street to Fourth Street, which was started in October, 1953, extends over a distance of 0.7 mile and will provide on and off ramps at each end of this unit. Charles L. Harney, Inc., is the contractor on this $3,900,000 project.

Other Units

The other job is 0.2 mile long, between Third Street and Fifth Street. The work which is being performed by Eaton and Smith at a cost of $830,000 will provide a connection with the San Francisco-Oakland Bay Bridge and will later furnish a tie to the future Embarcadero.

To the south of the first unit of the Bayshore Freeway which was completed in San Francisco, work has been under way on a 1.7-mile contract which was awarded to Charles L. Harney, Inc., on May 25, 1953. This $2,400,000 project will be completed this July. The freeway lanes have already been opened to traffic and the only work which remains to be done is at the Third Street interchange. Thus, at this time a continuous section of freeway is in service for a total length of five miles in San Francisco from Third Street and Bayshore to the perimeter of the central district.

Urgently Needed Link

The most urgently needed link on the Bayshore Highway is the ultimate bypass of the congested area through Visitacion Valley in San Francisco and through Brisbane, between Third Street and Sierra Point. On the north end of this section, work was started on a contract in May, 1954, which was awarded to Edward Keeble for grading and structures between Third Street and Candlestick Point. This $700,000 project is 0.7 mile long.

Continuing southward from Candlestick Point the freeway alignment traverses open water of an arm of San Francisco Bay. Work was previously completed on two contracts for filling experimental sections of embankment on the bay mud. The first job extended 0.3 mile southward from Candlestick Point and the

LEFT—View of construction operations for closing of 3.6-mile gap in Bayshore Freeway. Candlestick Point in foreground, looking south across open water toward Sierra Point. RIGHT—Fill operation for Bayshore Freeway midway between Candlestick Point and Sierra Point. Wedge-shaped form is used during end-dumping operation to maintain outward flow of mud. This view, which shows shape of mud wave, was taken during low tide.

LEFT—View of Bayshore Freeway during final stages of construction looking north from vicinity of Hillsdale Boulevard interchange in San Mateo. RIGHT—View of Ralston Avenue interchange on Bayshore Freeway in Belmont near completion of construction.

second unit, 0.4 mile long, was located farther out in the bay where the mud depth was greater. Another step was taken when bids were opened March 16, 1955, for a $400,000 project to fill the gap between the two experimental units.

Over Water Fill

The work of constructing this fill is an interesting undertaking. The mud which reaches a maximum depth of 70 feet is highly fluid in its natural state. It has been determined that a dry fill could be constructed so as to reach a fairly stable condition through displacement of the mud by the weight of the fill material. This operation results in a mud wave extending ahead some 600 feet to 800 feet. As it was found that this mud has a tendency to set up when it remains undisturbed for a short period once initial displacement has occurred, a placing plan has been followed which concentrates the end-dumping of material on a small area at the forward end of the fill as long as subsidence continues at an appreciable rate. Also, the fill is pushed forward in the form of a pointed nose to maintain an outward flow in the mud wave. Whenever there is cessation of operations for more than 24 hours, such as over a weekend, charges of dynamite are jetted into the mud in advance of the fill and are set off to start the movement of the mud again as further weight is applied.

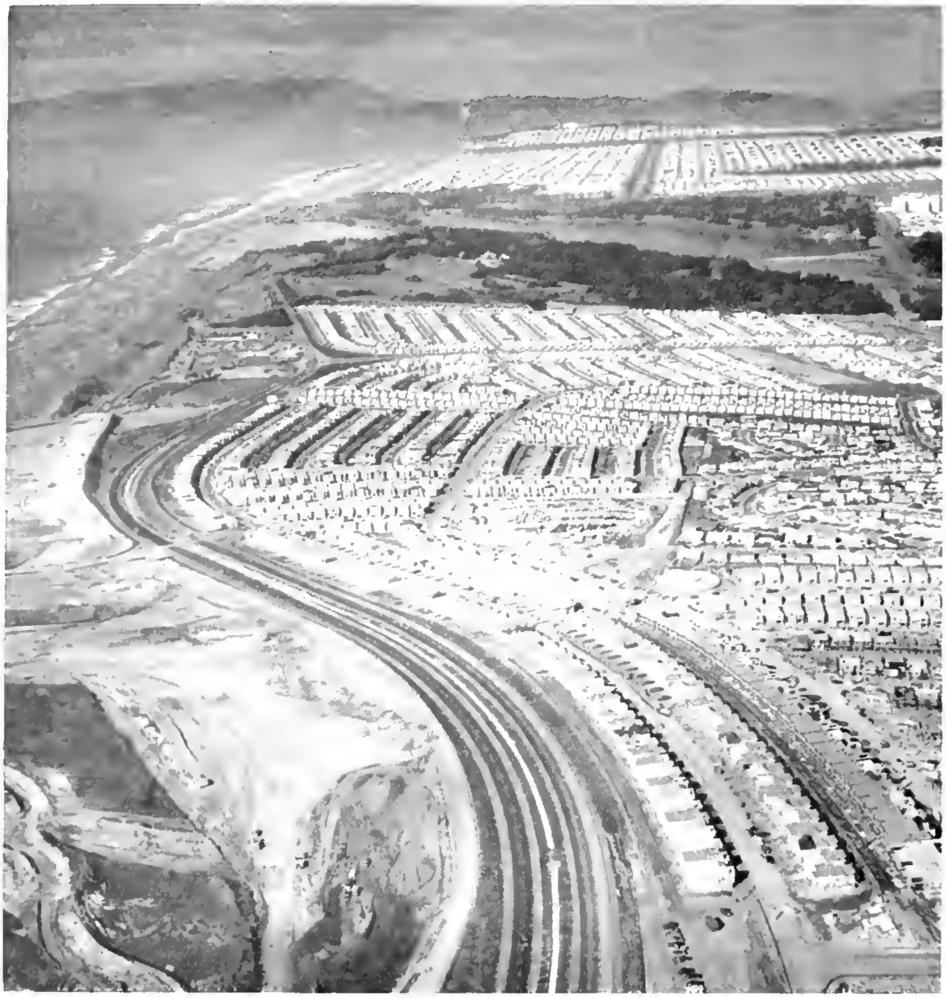
In this manner, work is progressing on a double shift basis on a $1,500,000 contract held by Guy F. Atkinson Company for continuing the fill southward through the central portion of the open water link. Continued progress is assured through funds which have been included in the 1955-56 budget in the amount of $3,200,000 to finance the final fill operation and building of structures on this section. Still another contract for paving of this 3.6-mile link will be required before a continuous freeway on the Bayshore from San Francisco to San Mateo County becomes a reality.

In San Mateo County

Continuing southward in San Mateo County, finishing touches are being applied to a five-mile contract by Piombo Construction Company on the Bayshore Freeway between Sixteenth Avenue in San Mateo and San Carlos. This $4,100,000 project is already serving traffic and has increased the continuous length of the facility already in use on the peninsula to 16.2 miles.

Thus, when the construction across the open water is completed, which is expected in 1957, a total length of 25 miles of freeway will be in operation from downtown San Francisco to San Carlos.

Further progress on this route is indicated through the opening of bids on April 6, 1955, for an 0.8-mile unit in the vicinity of Menlo Park, which includes an interchange at Willow Road. This intersection is presently the scene of maximum congestion on the remaining portion of the original Bayshore Highway between the San



Expressway improvement on Skyline Boulevard through area which is being rapidly developed in the northerly portion of San Mateo County

Carlos terminus of the freeway and San Jose.

In the San Jose area plans have been completed for a 1.6-mile section of the Bayshore Freeway from Santa Clara Street to Rosa Street. It is expected that the right of way will be cleared soon to permit early advertising for bids on this unit. Financing is provided through $1,600,000 in the 1955-56 Fiscal Year construction program.

CENTRAL FREEWAY

The start of a new freeway route was made available to San Franciscans through the opening of the initial unit of the Central Freeway on March 1, 1955. This freeway is shown on the city trafficways plan as extending from the Division Street Interchange on the Bayshore Freeway to the approach leading to the Golden Gate Bridge at a location near Lombard Street and Van Ness Avenue.

The completed section which is 0.8 mile in length, follows Thirteenth Street to a terminal ramp at Mission Street. The steel structure which supports the freeway, resembles the previously completed portion of the skyway and makes provision for local traffic at ground level beneath the facility.

Viaduct structures which form a wye at Division Street to permit direct interchange of traffic in three directions at Division Street, were finished at the same time as the Thirteenth Street lateral. The work on the wye connections and the main freeway unit was done by Charles L. Harney, Inc., under three contracts at a total construction cost of $4,500,000.

On April 1, 1954, a further step was taken when the California Highway Commission adopted the route for another section of this freeway which extends northerly to Turk Street. Plans are being prepared for this extension of the Central Freeway and the tempo of right of way acquisition will be stepped up by virtue of an allocation of $5,100,000 in the 1955-56 Fiscal Year program for this purpose.

EMBARCADERO FREEWAY

On March 2, 1955, MacDonald, Young & Nelson and Morrison Knudsen Company, Inc., submitted a low bid of $5,200,000 for building the first unit of the Embarcadero Freeway in San Francisco. This project will continue the skyway easterly from the point where the Bayshore Freeway connects with the San Francisco-Oakland Bay Bridge approach at Fourth Street to on and off ramps which connect with Mission Street at Beale Street and Main Street, respectively. The design for this project utilizes a two-level type of viaduct which separates opposing traffic vertically in order to keep the right of way needs to a minimum.

The 1955-56 Fiscal Year budget also provides financing in the amount of $2,600,000 for a second unit of the viaduct which will extend to the Embarcadero. Meanwhile, work is progressing on plans and negotiations are under way for the acquisition of right of way for the continuation of this artery northerly along the Embarcadero to Broadway.

SOUTHERN AND WESTERN FREEWAYS

With the approaching completion of final work on the Bayshore and the progress which has been made on the portions of the Embarcadero and Central Freeways, for which the routing has been determined, attention is now being directed to other segments of an integrated freeway system in San Francisco.

Two additional routes merit a high priority as projects which will facilitate the movement of large volumes of traffic within the city. These have been designated as the Southern and Western Freeways. The first of these routes starts at the county line in the

UPPER—Construction operations on additions to the distribution structure looking westerly toward the approach to the San Francisco-Oakland Bay Bridge. The dual two-lane roadways in the lower left of the picture are detours which have been constructed on temporary timber trestles. LOWER—View of construction operations on East Bay Distribution Structure looking east toward MacArthur Boulevard.

vicinity of Junipero Serra Boulevard and traverses the southerly portion of the city to a junction with the Bayshore Freeway at Alemany Boulevard.

The general route for the Western Freeway under study starts at the same location at the county line and traverses the western portion of the city in the area to the south of the Golden Gate Park and thence runs easterly to a junction with the proposed Central Freeway in the vicinity of Oak Street.

While both of these routes follow the general location of a combination of freeway facilities which have been delineated on the San Francisco Trafficways Plan, a number of alternate locations in these general areas will be reviewed during the study. The city

LEFT—View of the first completed unit of the Eastshore Freeway to the north of the distribution structure; Powell Street interchange in center; Ashby Avenue interchange beyond. RIGHT—View of construction operations for north section of Eastshore Freeway looking north from site of the University Avenue interchange toward the El Cerrito Overhead.

is also taking steps to implement the work which is being performed by the Division of Highways and their present studies include a proposal for a continuation of the Southern Freeway from the Bayshore Freeway to a junction with the proposed Southern Crossing.

EASTSHORE FREEWAY

Much activity has taken place in the metropolitan Bay area on the Eastshore Freeway during the past year. In September, 1954, Fredrickson & Watson Construction Company and M & K Corporation started work on a $1,700,000 contract on this route. Extending from Market Street between Fifth and Sixth Streets to Eleventh and Cypress Streets, this 0.7-mile project will provide an elevated facility which should be ready to carry traffic this September.

On the intervening 1.4 miles between this construction and the distribution structure, bids will soon be received for the continuation of the improvement. On this particular section the freeway is to be carried on a double-deck viaduct in a manner similar to the plan which has been developed for the Embarcadero Freeway in San Francisco. A budget allocation of $7,015,000 to finance the work is the largest amount that has ever been earmarked for a single highway contract in the Bay area.

Next in sequence on this route is the $4,500,000 contract with MacDonald, Young & Nelson, Inc., and Morrison Knudsen Company, Inc., for the expansion of the distribution structure. Three additional ramps are being provided in conjunction with the modification of portions of the existing structure.

The original structure was an early example of a direct type of interchange that served traffic well until a fourfold increase to a volume of about 120,000 vehicles per day occurred. The improvements now under way which are expected to be finished in October, will allow for doubling of present traffic without congestion. The expanded structure is laid out on three levels which results in the elimination of cross weaving traffic movements.

Congestion Eliminated

Continuing north from the distribution structure a 1.5-mile section of the Eastshore Freeway was completed in November, 1954, by Peter Kiewit Sons' Company at a cost of $2,800,000. This project eliminated the congestion which resulted from the first of a series of signalized intersections on the Eastshore Highway through an interchange which was provided at Powell Street.

From Ashby Avenue northerly to the El Cerrito Overhead work has been under way on a $4,800,000 contract, also held by Peter Kiewit Sons' Company for the continued conversion of the northern section of the Eastshore Highway to an eight-lane freeway. This contract which is scheduled for completion in August covers grading for the full three-mile

Construction scene on Eastshore Freeway project in Oakland from Market to 10th Street where route turns into Cypress Street and runs north. The 1.4-mile section along Cypress from this project to the distribution structure is scheduled to be started this year as a two-level viaduct at an estimated cost of $7,015,000.

LEFT—Construction operations on Route 228 connection between the Eastshore Freeway at San Lorenzo and Castro Valley. RIGHT—Looking east along location of Route 228 connection from Washington Avenue interchange on Eastshore Freeway to the recently completed Castro Valley Bypass which appears in the distance.

length, paving between Ashby Avenue and University Avenue, and construction of the Ashby Avenue Interchange.

This interchange is now in use and as a result the second in the series of signalized intersections is now carrying heavy volumes of traffic without interruption. The scheduled completion date for the remaining work on this project is August, 1955.

On January 3, 1955, work was started on a $2,250,000 contract awarded to Stolte, Inc. & Gallagher & Burk, Inc., for the balance of the paving and structures between University Avenue and the El Cerrito Overhead. The operations on this 1.6-mile project are expected to be completed in October, 1956.

On the southerly section of the Eastshore Freeway a noteworthy addition to the Bay area freeway system was made on July 2, 1954, when a 9.3-mile portion from Warm Springs to San Jose was opened. Constructed to full freeway standards, this facility includes traffic interchanges at important intersections and affords a much needed measure of relief to traffic on Highway 17 between San Jose and Oakland. The work was accomplished in two contracts, one held by the Fredrickson & Watson Construction Company and M & K Corporation, and the other by the Granite Construction Company, at a total cost of $4,000,000.

At the present time a 14-mile gap exists on this route between Warm Springs and the southern end of the previously constructed freeway units between Oakland and Hayward. Progress toward the final elimination of this gap is seen, however, as $4,500,000 has been included in the 1955-56 Fiscal Year budget for a 5.6-mile southward extension to Beard Road.

It is expected that bids will be received for construction of this project late this summer. Meanwhile, work is going forward on plans and acquisition of rights of way for the section which will culminate in the final closing of the gap. When this is accomplished a total length of 38.0 miles of modern facility will be providing traffic service between San Jose and Oakland and the Eastshore Freeway-south will be completed except for a short stretch within the City of Oakland.

US 50

A 1.5-mile freeway bypass through Castro Valley on Route US 50 was opened to traffic on September 14, 1954. The work was performed by Fredrickson Brothers under a $1,270,000 contract.

Continuing westerly from the completed unit, work has been under way since June, 1954, on a 2.9-mile section of full freeway that will tie into the Eastshore Freeway at San Lorenzo. The construction which is being performed on this $2,900,000 contract by Ball & Simpson, Erickson, Phillips & Weisberg, is expected to be completed next December.

To the east of the Castro Valley bypass plans have been completed for the improvement of a final 5.3-mile section of the original route between

Castro Valley and the San Joaquin Valley which remains to be improved to modern standards. As the 1955-56 budget includes an item of $4,680,000 for this final link, it is expected that work will be under way on a contract at this location this summer.

At the easterly boundary of Alameda County a District X project which extended from Tracy to the Altamont Pass included a 1.7-mile section in Alameda County. The completion of work on this expressway marked an important step forward in providing an adequate highway facility from the San Joaquin Valley to the Bay area. The completion of two projects, one currently under construction and one which has been budgeted, will result in a continuous freeway or expressway ride from Tracy to Oakland, a distance of 51 miles via US 50 and the Eastshore.

The heavy traffic on the metropolitan terminus of this route emphasizes the need for the completion on a direct alignment to the Bay Bridge approach in Oakland. Such a measure would not only relieve the load caused by through traffic on this route which is presently using the Eastshore Freeway between San Lorenzo and Oakland, but would also furnish a vital traffic service to local users. To accomplish this a step was made on January 26, 1955, when the California Highway Commission adopted a route for a portion of a freeway along MacArthur Boulevard between the distribution structure and Park Boulevard in Oakland.

Following the commission action work has been pressed on the plans for this freeway unit and funds have been made available to commence the acquisition of necessary rights of way.

Expressway on US 50 at crossing of the Delta Mendota Canal near the Alameda-San Joaquin County line. New construction joins with the original four-lane divided facility through the Altamont Pass in the distance where the ramps of an interchange are discernible.

Meanwhile, studies are also under way which will lead to the determination of the remaining section through Oakland, together with its easterly extension to Castro Valley.

MOUNTAIN BOULEVARD

The improvement of Mountain Boulevard in the City of Oakland to freeway standards was originally undertaken by Joint Highway District No. 26. Work on a 1.1-mile section near Lake Temescal was previously completed under the direction of the joint highway district. At the request of Alameda and Contra Costa as member counties, together with the City of Oakland, the State agreed to the dissolution of the joint highway district on July 1, 1954, in a measure which was taken in an effort to speed up the development of this route. The action was taken with the understanding that Alameda County and Oakland would continue to contribute toward the financing of the future projects.

On March 30, 1955, bids were opened for a one-mile project between Thornhill Drive and Ascot Drive with an estimated cost of $1,200,000. It is also expected that bids will soon be received for a $150,000 separation structure at Lincoln Avenue on this route.

US 40—RICHMOND TO CARQUINEZ

Construction of this freeway was started at the Richmond end by the award of a contract to MacDonald, Young & Nelson, Inc., for two structures, one over the Santa Fe tracks at 47th Street and one over San Pablo Creek. This work was completed in November, 1954, at a cost of $380,000. Work on the principal contract was started in November, 1954, when Fredrickson & Watson Construction Company started operations on a $5,400,000 contract which will complete the initial 4.8-mile unit in July, 1956.

Meanwhile work is continuing on the plans and acquisition of right of way for remaining sections of this route northerly to the Carquinez Bridge and southerly to the Albany Overhead in Alameda County where the work previously described as part of the Eastshore Freeway commences.

View of final stage of construction of the Orinda interchange

OAKLAND-WALNUT CREEK AND CONCORD-DANVILLE

The congestion on Highway 24 to the east of the Broadway Low Level Tunnel has been at record level for the past few years due to the accelerated development which has occurred in the westerly portion of Contra Costa County. The first material progress toward alleviating this condition was realized on March 10, 1955, when a 1.2-mile section of freeway, including an interchange at Orinda Crossroads was fully opened to traffic.

The work was performed by Fredrickson & Watson Construction Company and M & K Corporation, at a cost of $1,500,000.

Bids were opened on March 30, 1955, for a similar type of project which will provide an interchange at the Pleasant Hills Road intersection. The estimated cost of this 1.3-mile undertaking is also $1,500,000.

Additional work which has been included in the 1955-56 Fiscal Year program includes a 2.8-mile freeway bypass of Lafayette which is immediately west of the Pleasant Hills Road Interchange project and another section, also 2.8 miles in length, extending northerly from Walnut Creek to Monument. The budget allocations for these projects are $3,800,000 and $3,580,000 respectively, and it is anticipated that right of way will be cleared to permit receiving bids for both of these projects early this summer.

Further progress in the improvement of highway transportation in this area occurred on January 26, 1955, when the California Highway Commission adopted a route for the further extension of the freeway system from a wye in Walnut Creek in a southerly direction to a point one mile south of Danville. Meanwhile, improvement of another portion of the Danville Highway is foreseen as bids were opened on March 23, 1955, for improvement of a 2.1-mile section extending northerly from Dublin to a point near the Alameda-Contra Costa county line.

While an interchange will be provided through a separation which is to be built at the Dublin intersection with US 50, a plan is being followed that has been used on other recent construction in rural areas. The initial two lanes of a future divided facility will be constructed on this project and sufficient right of way together with access control has been acquired in order that the improvement may later be developed into a full freeway when traffic conditions and availability of further funds warrant such action.

ARNOLD INDUSTRIAL FREEWAY

With the previous improvement of the portion of the Arnold Industrial Highway in Contra Costa County as a partial freeway through the congested area between Willow Pass and Antioch, work on this thoroughfare was limited to a single project during the past year.

The conflict of traffic at the intersection at grade which was originally provided at Loveridge Road reached a magnitude which warranted a higher standard of development. Under a cooperative agreement with the county, an agreement was made calling for the State to pay for the cost of a separation structure and Contra Costa County to pay for the connecting ramps, which actually constituted the major portion of the project.

A contract was subsequently let to Gallagher & Burk, Inc., at a cost of

$280,000 in March, 1954, for the construction of an interchange at this location and the improvement was opened to traffic on April 1, 1955.

Thus, while a limited freeway does not provide the same measure of safety and convenience which is obtained from the full development, the work which has been done at the Loveridge Road intersection is an example of what may be accomplished in the future at other locations on expressways.

SKYLINE BOULEVARD

With the development of the residential areas in San Mateo County extending easterly from the coast and westerly from the peninsula to a point where the subdivisions are converging upon the ridge along which Skyline Boulevard is located, emphasis has been placed upon the need for an improved facility to serve as an additional major connection with San Francisco.

December, 1954, marked the completion of the first project which provided a 2.3-mile section of expressway from Edgemar Road at Alemany Boulevard, at a cost of $1,000,000.

To the north of the completed section plans have been completed and bids will soon be received for two additional units which will extend the improvement to Lake Merced Boulevard in San Francisco at an additional expenditure of approximately $1,000,000.

LOS GATOS-SANTA CRUZ

To keep pace with the traffic needs beyond the immediate metropolitan area, emphasis has been placed on freeway bypasses designed to relieve congestion which accompanies locations through residential and commercial districts. Such a situation is being met in the town of Los Gatos through the construction of a 2.4-mile bypass.

Work will soon be finished on structures for the future freeway under a $370,000 contract with Carl N. Swensen Company.

Meanwhile, operations are now under way on a second contract which was awarded to L. C. Smith for the balance of the roadwork on this project. It is expected that work, which will cost $1,300,000, will be completed in November.

In Santa Cruz action also has been taken to relieve the congestion which has resulted from the routing of highway traffic over city streets. Here, a $1,270,000 project which will extend from the north city limits of Santa Cruz on the Santa Cruz-Los Gatos highway to Mission Street, is scheduled to be ready for the advertising of bids by mid-year.

US 101—GOLDEN GATE BRIDGE TO SANTA ROSA

The past year has witnessed a number of important steps toward achieving a continuous freeway be-

LEFT—Construction operations on Golden Gate Bridge Freeway immediately north of the bridge. New lanes will lead to portal of twin bore of Waldo Tunnel which appears to right of existing tunnel portal. RIGHT—Construction operations for Golden Gate Freeway.

Construction operations on foundations for new bridge across Richardson Bay in Marin County. When the new six-lane divided facility is completed the existing timber bridge which has reached the end of its useful life will be removed.

tween the Golden Gate Bridge and Santa Rosa. The Waldo approach which has recently been appropriately designated as the Golden Gate Bridge Freeway, has been the scene of two major contracts.

The Guy F. Atkinson Company is finishing their work on a $4,500,000 contract which covered grading, construction of a twin bore opposite the Waldo Tunnel and structures on a 4.0-mile section of this route. Work has also been started on the second job, a $1,300,000 contract with A. G. Raisch Company, for completing the construction and paving of this unit. The work on this final contract is scheduled to be finished in December. The Golden Gate Bridge and Highway District contributed $5,000,000 toward the cost of this project.

One mile north of the Waldo approach, the building of a new bridge across Richardson Bay is well under way. The contract for this $3,200,000 structure is held by Duncansen, Harrelson & Pacific Bridge Company, and work is scheduled for completion in October, 1956. Meanwhile, funds have been budgeted in the 1955-56 Fiscal Year to fill in the gap between the Waldo approach and the new Richardson Bay Bridge, as well as to extend the freeway to a point 0.3 mile north of the Alto intersection. Bids have been requested for this 1.5-mile unit for which $1,730,000 has been allocated.

Greenbrae Intersection

Several miles to the north a measure of relief will be provided at the Greenbrae intersection. This will be in the form of construction which is proposed from a $1,000,000 allocation in the same budget to finance a portion of the Greenbrae interchange. The initial work which will serve as an interim development will separate southbound traffic and thus remove the most serious bottleneck on US 101 in Marin County and at the same time provide substantial relief for northbound traffic. The balance of the work required to complete this interchange, together with the adjacent sections of the freeway including an interchange at the Corte Madera intersection, will follow at a later date.

Another step in the over-all program to provide an integrated modern highway transportation network, occurred on June 17, 1953, when the California Highway Commission adopted the routing for a freeway connection between the San Quentin wye just south of San Rafael and the westerly end of the Richmond-San Rafael Bridge. Plans are being prepared for this 2.2-mile link so as to permit scheduling of the improvement to coincide with the completion of the bridge. The initial facilities will be required in October, 1956, when it is expected that the first deck of the bridge will be finished. The planning includes the necessary consideration for the expansion of these facilities at such time as the second deck of the structure is placed into service.

Petaluma Bypass

Strides are also being made in the area from Petaluma to Santa Rosa to overcome the congestion on the existing route through the heart of the business district in Petaluma, and upon the present two-lane highway extending northerly to Santa Rosa.

Two current contracts cover work which is in progress on the Petaluma Bypass. The first one to be let covered two sets of twin structures which are being built across the navigable channel of Petaluma Creek and over the tracks of the Northwestern Pacific

Railroad. This construction, done at a cost of $900,000, is practically completed, and was performed by Frickson, Phillips and Weisberg.

The second contract, held by Parrish Brothers and Carl N. Swenson Company, extends northerly 8.6 miles from a point one mile south of Petaluma Creek. This job covers grading for the entire length and paving and structures on the southerly five-mile portion which will constitute the Petaluma Bypass. The operations are scheduled for completion in June, 1956, at a cost of $3,700,000.

On March 16, 1955, bids were opened for a northward extension of this freeway to Wilfred Crossing. This project, which is estimated to cost $2,800,000, includes paving of a three-mile graded section of the preceding contract and will result in a freeway unit 7.9 miles in length when finished.

Plans are nearing completion and right of way is being acquired for the remaining section between Wilfred Crossing and Santa Rosa, a distance of 5.0 miles.

NAPA AREA

Representative of a project which has been designed to replace a section of substandard alignment in a rural area, is the work under way on a 2.7-mile section on Sign Route 37 in Napa County. The work extends easterly from a point two miles east of the Sonoma-Napa County line and the current operations cover the construction of the initial two lanes of a future four-lane freeway facility for which the right of way and access control have already been provided. The $410,000 contract with Arthur B. Siri, Inc., will be completed later this summer.

Route of the freeway bypass of Petaluma where operations are under way on two contracts for the structures and roadwork for the new facility

A further improvement of this nature is also projected at another location in Napa County. On August 25, 1954, the California Highway Commission adopted a freeway routing for a five-mile section of the St. Helena Highway, extending from the north end of the Napa Bypass to one mile south of Yountville. While the initial construction has not yet been programmed, funds have been included in the current budget to commence the acquisition of rights of way.

Plans are completed and right of way is being acquired for the construction of an expressway between four miles north of St. Helena and Calistoga, a length of 3.7 miles. An initial two-lane facility with right of way for ultimate four lanes is proposed.

SERVING HEAVY URBAN TRAFFIC DURING CONSTRUCTION

Most of the major freeway projects in this area have been developed along the locations of the existing highway routes as economics have dictated the incorporation of some of the original improvements and right of way as a part of the new facility. This condition has posed many problems of a complex nature in the planning and construction of the individual projects.

As the freeways which have been started or completed thus far were of high priority because of traffic congestion, it was considered essential that traffic should be subjected to a minimum of inconvenience during the construction period. In this regard the actual goal has been to make provisions for the conduct of traffic through the work on a par with the service offered by the original facility. In many cases this meant construction of multilane, paved detours conforming to geometric standards acceptable for prevailing speeds. In some cases portions of ramps and frontage roads were developed on an expanded basis to serve this purpose.

No doubt the greatest challenge to our design and construction engineers has occurred on the current contract for the modification of the East Bay Distribution Structure. Here, an existing facility which in its original form was a complex direct type of interchange carrying 120,000 vehicles per day, is being expanded to more than twice its initial size. The new construction is closely interwoven under, over and alongside the present ramps.

It has also been necessary to remove portions of the structure where connections are being made to the new facilities. This has been accomplished in part by the construction of two sections of a trestle type detour alongside portions of the ramps. Except for a relatively few occasions when it was necessary to erect steelwork over traveled roadways, and a small number of vehicles was required to follow a detour routing during early morning hours, the bulk of the traffic has continued to use the facility without inconvenience from the work.

RIGHT-OF-WAY ACQUISITION

Perhaps the most important and certainly the most remunerative single step in economical use of highway funds was the creation of a revolving fund for the advance acquisition of rights of way. The California Legislature in 1952 made available to the Highway Commission, the sum of $10,000,000 as an advance fund to be used for the purchase of rights of way where pending expensive development patently conflicted with proposed freeway routes, and where construction could not be financed for several years. In 1953 the fund was increased to $30,000,000 permitting full operation of this program of prior purchase.

Funds in the amount of approximately 5 million dollars have been authorized in this district and of this total, about 3 million has been obligated. Time and effort required in the acquisition of real property is a matter of common knowledge. To reap the potential savings in the advance acquisition plan has required constant vigilance, however, the results have justified the intensity of the effort. In addition to preventing development on land required for future projects which would later be removed to the inconvenience and possible intangible loss to investors, properties now purchased under the advance acquisition plan for $19,000,000 would otherwise cost the State an amount estimated at $114,000,000.

CONCLUSION

The expeditious, convenient and safe movement of traffic has been a primary objective in this program of modernizing highway transportation. Elimination of grade crossings, reduction of side friction due to multiple access, high standards of grade and alignment, wide traffic lanes, and improved signing, have, among numerous other features, produced facilities which encourage rapid and convenient transportation through maintained speeds over long distances. What, then, is the story of safety?

Unfortunately, safety cannot be effectively discussed without reference to accidents; the lack thereof, being the direct result of the degree of safety which the facility offers. The period of observation has been sufficiently long to permit reliable appraisal, particularly with respect to accidents involving fatalities. While accidents involving property damage or minor injury are of great consequence, the heavy toll of fatal accidents in itself, stresses the need for effective action.

It is customary to refer to fatality statistics in terms of 100,000,000 vehicle

. . . Continued on page 21

STATUS OF DISTRICT IV FREEWAY PROJECTS

March, 1955

	Total miles	Completed projects		Under contract		Budgeted		Right-of-way cost
		Miles	Construction cost	Miles	Construction cost	Miles	Construction cost	
Bayshore Freeway; Bay Bridge to San Jose	48.8	15.1	$23,126,000	9.1	$14,394,000	5.9	$5,850,000	$30,159,000
Central Freeway; Bayshore to Turk Street	1.9			0.8	3,649,000			1,865,000
Eastshore Freeway; Richmond to San Jose	55.7	26.1	26,583,000	5.7	14,785,000	7.0	11,515,000	21,767,000
U. S. 101; Golden Gate Bridge to Santa Rosa	51.1	26.0	5,298,000	13.6	13,578,000	7.1	5,530,000	16,867,000
Black Point Cutoff; Ignacio to Sears Point	7.3	0.7	1,004,000					222,000
Napa Area; Solano County Line to Union Station	31.1	14.6	1,441,000					712,000
U. S. 40; Richmond to Carquinez Bridge	13.8		388,000	4.8	5,441,000			4,120,000
Arnold Industrial Freeway; Hercules to Bridgehead Ave.	53.2	13.8	4,400,000		285,000			1,358,000
Oakland to Arnold Industrial Freeway near Ohmer	19.4	2.3	226,000	1.2	1,579,000	6.7	8,880,000	2,700,000
Mountain Blvd; Tunnel Freeway near Lake Temescal to San Leandro	9.3	1.1	1,297,000			1.0	1,350,000	540,000
Altamont Pass; San Lorenzo to San Joaquin County Line	33.9	26.4	7,094,000	2.9	2,900,000	5.3	4,680,000	7,341,000
Pacheco Pass; 1 Mile east of Bell's Station to Merced County Line	5.3	5.3	1,285,000					20,000
El Camino Real; San Jose to San Benito County Line, portions	14.4	14.4	2,856,000					1,269,000
Santa Cruz to Watsonville	15.3	7.7	2,740,000			1.3	1,270,000	1,779,000
San Jose to Santa Cruz	21.1	1.8	1,337,000	2.4	1,699,000			2,577,000
Skyline Boulevard; San Francisco County Line to Edgemar Road	3.4	2.2	640,000			0.9	348,000	1,073,000
Embarcadero Freeway; Bay Bridge to Broadway	1.5					1.2	8,000,000	9,950,000
Park-Presidio Freeway; Golden Gate Bridge to Fulton Street	2.0	1.1	1,172,000	0.5	454,000			50,000
Totals	388.5	158.6	$80,887,000	41.0	$58,764,000	36.4	$47,423,000	$104,369,000

Monticello Dam

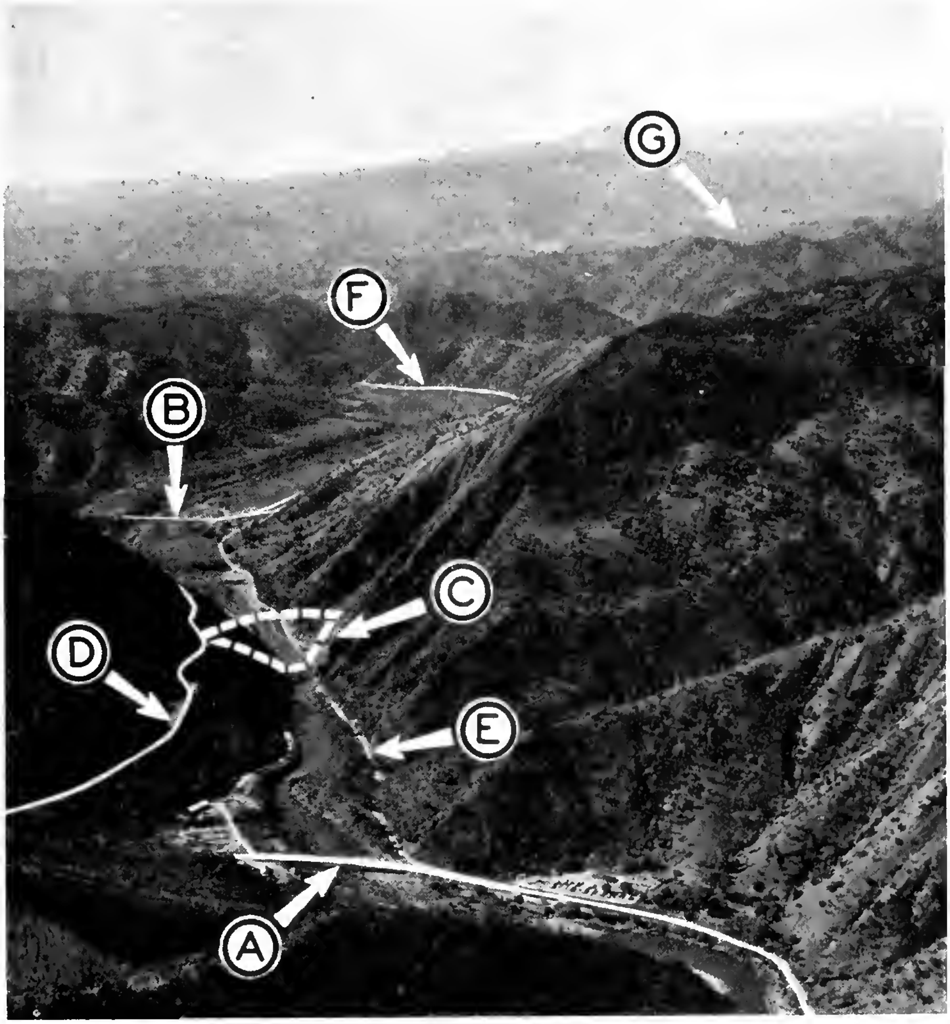
Highway Relocation Is Through Rugged Terrain

By L. C. GABEREL, Senior Highway Engineer

Construction of the Monticello Dam as part of the Solano Project of the U. S. Bureau of Reclamation has necessitated the relocation of portions of Routes 6 and 102, State Sign Routes 37 and 128.

The dam, as presently being constructed, is a reinforced concrete arched type, 270 feet high and 1,017 feet long. It is located on Putah Creek at "Devil's Gate," at the approximate junction of Napa, Yolo and Solano Counties where Putah Creek is in a rocky canyon. The reservoir will stretch for more than 20 miles above the dam, the main body of the reservoir being in the Berryessa Valley. This valley is about 11 miles long and 2½ miles wide and is composed of fertile lands devoted to agriculture. The Town of Monticello is located in this valley and will be covered with approximately 100 feet of water when the reservoir is full. The capacity of the reservoir is 1,600,000 acre-feet and it covers more than 20,000 acres of land.

When the dam is completed and the reservoir is full of water, approximately 16 miles of the existing state highway will be inundated. The total amount of existing highway replaced by the 16.3 miles of new construction will be 21.5 miles. The portions of existing highway not subject to inundation but replaced by the new location will probably remain as county road.



(A) Permanent bridge across Putah Creek; (B) Temporary bridge across Putah Creek; (C) "Devil's Gate" domsite, Monticello Dam; (D) Relocated highway, Unit No. 1; (E) Highway Route 6 now abandoned; (F) Highway Route 6 to be abandoned; (G) Berryessa Valley

Project in Three Units

The sections of relocated highway are being built in three units. The survey and design work for all three units have been accomplished by the Division of Highways with the Bureau of Reclamation handling the field engineering and inspection work during construction.

Since the existing highway passed through the location where dam construction must start, a detour road above the top of the south abutment of the dam had first priority. About one-half of this 2.8-mile-long detour is on temporary location that will be inundated, but is necessary to carry public and contractor's traffic during construction of the dam proper. This first unit cost approximately $1,175,000 and was included as part of the initial contract for the dam. It starts in Yolo County and immediately crosses Putah Creek into Solano County. It then runs on a 7 percent grade up Cold Canyon across rocky bluffs above the dam and to a point just beyond where the permanent construction ends. The temporary construction then descends on a 9 percent grade, again crosses Putah Creek and ties back into the existing highway just west of the dam site in Napa County. The bridge across Putah Creek on the permanent construction was designed by the Bureau of Reclamation to Division of Highways standards. It is 26 feet wide between curbs, 448 feet 8 inches long, of re-

(A) Abandoned State Highway Route 6; (B) Permanent portion, Unit No. 1; (C) Temporary portion, Unit No. 1; (D) Unit No. 2, showing relocated Route 6 winding down into Markley Canyon; (E) Shows 160-foot fill at Station 118 and 185-foot cut at Station 121

inforced concrete, with prestressed-precast beam construction on round piers with eight equal spans. The bridge across Putah Creek on the temporary portion, also designed by the Bureau of Reclamation, is of timber construction 24 feet wide and 456 feet long.

Heavy Construction

The second unit of road, now under construction, is about 10 miles long and runs from the approximate dam site to the head of the Capell Valley at the junction with the existing Route 6. This unit, at the approximate cost of $1,700,000, was let as a separate contract by the Bureau of Reclamation. The construction is through precipitous country with brush-covered, rocky hillsides. Grades up to 7 percent must be used on rather tortuous alignment. There are many deep cuts and high fills; the maximums are 185 feet and 160 feet respectively.

The third unit, about 4.9 miles long and estimated to cost approximately $725,000, is soon to be advertised for construction by the Bureau of Reclamation. It runs from the head of Capell Valley to the junction with Route 102, about 15 miles east of Rutherford. Some of this unit is also in steep, brushy country but a good portion is through comparatively level meadow lands along Capell Creek. There is one bridge on this unit designed by the Bridge Department. It is 26 feet wide and 205 feet long with steel girders on concrete piers.

Major Construction Items

The roadway section for the permanent construction is 26 feet wide, all paved with two inches of plant-mixed surfacing. The total cost of all this road construction is approximately 3.6 million dollars. The major construction items for the total relocation amount to: 210 acres of clearing, 2,200,000 cubic yards of roadway excavation, 13 million station yards of overhaul, the one temporary and two permanent bridges previously mentioned, a double 8 x 8 foot reinforced concrete bridge at Soda Creek, a double 8 x 7 foot reinforced concrete bridge at Oak Moss Creek, a large number of multiplate culverts ranging in size from 60 inches to 150 inches in diameter, and many smaller pipe culverts of reinforced concrete and corrugated metal.

The first unit, now completed, was part of a $7,628,991 contract let to Peter Kiewit Sons' Co. & Parish Bros. as a joint venture. The second unit is a $1,663,806 joint venture contract let to Stolte, Inc., Gallagher & Burk, Inc., and Lee Stephens.

The third unit has been designed and the Bureau of Reclamation is preparing to advertise for bids.

The Solano Project, of which the highway relocation is a part, is under the supervision of B. P. Bellport, Construction Engineer for Region 2, Bureau of Reclamation, with headquarters in Winters. Road construction resident engineer for the bureau is Dee Wren.

NEW COMMISSIONER PUBLIC ROADS

Secretary of Commerce Sinclair Weeks has accepted the resignation of Francis V. du Pont, of Wilmington, Delaware, as Commissioner of Public Roads, and appointed him Special Assistant to the Secretary in developing the President's 10-year National Highway Program. Simultaneously Secretary Weeks appointed Charles D. Curtiss of Kensington, Maryland, Deputy Commissioner, to succeed du Pont as Commissioner.

Mr. du Pont has served as Commissioner of the Bureau of Public Roads, U. S. Department of Commerce, since April 1, 1953.

To Death Valley

Main Access to Monument From West Greatly Improved

By GENE SNYDER, Resident Engineer

Completion of a contract on State Sign Route 190 in Inyo County was the fourth in a series of projects which have greatly improved the main access route to Death Valley National Monument from the west. The last unit constructed began two miles south of Lone Pine at the junction with US 6/395 and continued southeasterly around the north side of Owens Lake, which is now dry, to a point approximately four miles northwest of the town of Keeler, a distance of 7.9 miles.

The old roadbed was exceedingly narrow and alignment and sight distance were poor. Throughout the project the grade line followed the existing ground line and was well below the adjacent ground, mostly in a trench section which collected runoff water, blowsand and debris.

Route Is Shortened

The new alignment shortened the route about 0.4 mile and eliminated two crossings of spur tracks to mines and quarries from the narrow gauge Southern Pacific Railroad. The roadbed section consisted of two 12-foot lanes with 2-foot shoulders of road-mixed surfacing over three inches of imported base material.

The eastern half of the project traversed an area of sand dunes which during extremely heavy sand storms, had buried the old road at various times in the past. A turnpike design was used in this area to raise the grade line well above the surrounding countryside to prevent the accumulation of drifting sand on the roadway.

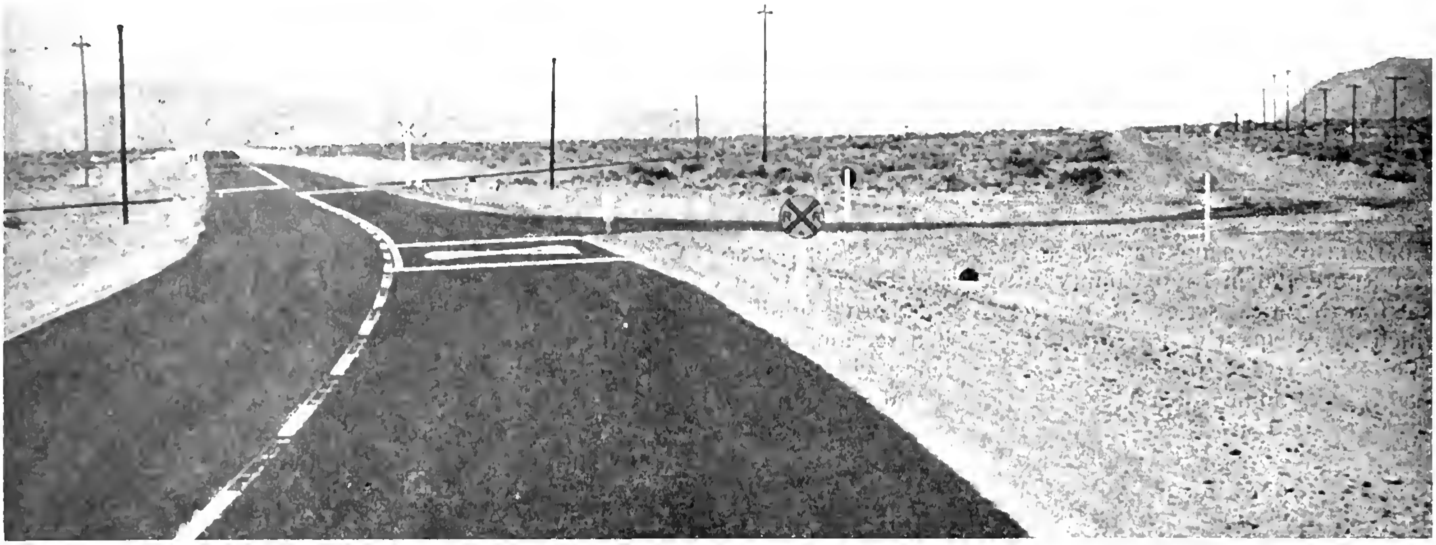
The contract for this project was awarded on April 5, 1954, to George E. France Co., Inc., of Bakersfield. Work was started April 16 and completed August 16, 1954, at a cost of $158,900, exclusive of engineering.

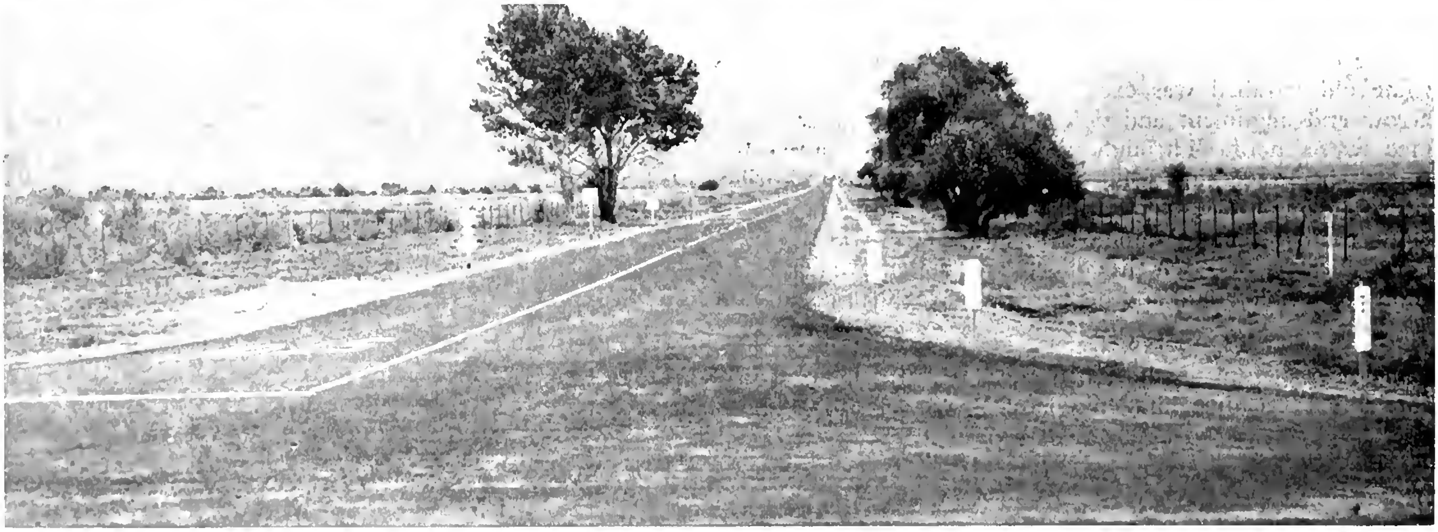
Slope Finishing

The major portion of the earthwork consisted of excavating sandy material from borrow ditches at the sides of the road to make the roadway embankment in the middle. Side slopes were mostly 6:1 with back slopes excavated at 4:1. As the grading progressed on the project it was noted that the contractor was having trouble finishing the loose sand slopes with ordinary grading equipment. At the suggestion of Milton Harris, then district engineer, the contractor built a drag, consisting of a 10-foot piece of railroad rail and six truck tires. The drag was laid out in a triangular shape by tying three tires to the rail, then a row of two tires followed by a single tire, thus forming a flexible mat. The drag was pulled rail side first by a small crawler tractor and did an excellent job of finishing the slopes.

While constructing embankments the contractor had some difficulty applying enough water to obtain compaction. Nearly twice the amount of

Looking easterly. Owens River Bridge in middle distance. Old road to left and new alignment to the right in background.





UPPER—Looking northwesterly from end of project. Old highway to the right with new crossing of the Southern Pacific Railroad narrow-gauge tracks to the left. CENTER—Beginning of job looking easterly from junction with US 6/395. LOWER—Looking easterly showing junction of old and new alignments.

water estimated was necessary to complete the earthwork. While excavating for culverts it was noted that water applied during construction of embankments had percolated to a depth of eight feet.

Water From Owens River

Water was obtained from the Owens River which crosses the project about 2.6 miles from the point of beginning. Normally water flows the year around at this location even though the main flow of the river is diverted into the Los Angeles Aqueduct approximately 30 miles upstream. Fortunately, the work was well ahead of schedule as the water supply dried up during the week the contractor finished hauling imported base material.

State Sign Route 190 east of the Sierra carries local traffic of the Keeler, Darwin and Panamint Valley area and through traffic from the Death Valley and Las Vegas area. A special traffic count taken February 25, 1953, revealed that about 80 percent of the traffic consists of trucks hauling ore and vehicles transporting employees to and from the mines.

Each year this route is becoming more important as an outlet for a large area where strategic minerals are mined and ores milled and carried by trucks to mills and markets. One of the largest mines in the area is the Anaconda Copper Mining Company's lead and zinc mine at Darwin which employs 250 people when in full production.

GUTHRIE VICE CHAIRMAN

James A. Guthrie, member of the California Highway Commission and publisher of the San Bernardino *Sun*, was elected vice chairman of the commission to serve for the year ending January, 1956, it was announced by Chairman Frank B. Durkee.

Guthrie, serving his fourth term on the commission, succeeds Chester H. Warlow of Fresno as vice chairman.

TAXI, TAXI

There are some 750 taxicabs in San Francisco and over a thousand in Los Angeles.

FOURTH ANNUAL BONNEROO

The Construction Department of District VII, Division of Highways, will have its Fourth Annual Bonneroo Stag Party at the Rodger Young Auditorium, 936 West Washington Boulevard, Los Angeles, on the evening of May 6, 1955.

F. B. Cressy, Assistant District Engineer, Construction, District VII, conceived the idea for these annual get-togethers some four years ago, and they have proved a great success in promoting a spirit of friendly rivalry and competition among both engineers and contractors to produce the best work.

The purpose of this party is to honor resident engineers and contractors who completed the 10 best contracts in District VII during the calendar year 1954. The occasion also provides an opportunity for Division of Highways personnel and contractors to become better acquainted by spending an enjoyable social evening together.

The 10 best contracts will be announced at the party. The resident engineer and the contractor on the best contract will each be awarded a "topper," a trophy consisting of a miniature gold plated roller, mounted on a pedestal with suitable inscription commemorating the award and the occasion. Assistant resident engineers and the contractor's superintendent on the best contract will be awarded certificates of merit.

Last year's winners were Haig Ayanian, resident engineer, and Ukropina, Polich and Kral, contractors.

Division of Highways personnel and contractors and their employees, are cordially invited to attend.

DISTRICT IV FREEWAYS

Continued from page 16 . . .

miles, and expressed in such figures, the rate on rural highways is 9.39—far too many, but nonetheless true. However, on the same basis, the rate on full freeways is 2.12, thus permitting the comparison that despite high volumes of traffic, motorists are four to five times as safe per mile while travelling on the modern freeway. Such a comparison is a measurement of progress which is most gratifying.

This report covers a year of significant progress in the development of the metropolitan freeway system in District IV. As in all projects of magnitude, the initial planning and processing is not apparent. Only in the latter phases of development does achievement meet the eye. While greater accomplishments may be attained, nevertheless this has been a year of visual evidence that a continuous and integrated freeway system is developing toward the usefulness its planners envisioned. With continued progress on an undiminished scale the light can be seen which will mark the realization of such a system.

FARMERS AND THE MOTOR VEHICLE

Farmers in the United States own nearly 7,000,000 cars and trucks.

Prof. Moyer Honored

A university of California engineer has received a distinguished service award for outstanding achievement in highway research, the National Research Council has announced.

Ralph A. Moyer, professor of civil engineering at the university's Berkeley campus and research engineer in the Institute of Transportation and Traffic Engineering, was one of two men to receive the Roy W. Crum Award for Distinguished Service at a recent meeting of the Highway Research Board, National Research Council in Washington, D. C.

Professor Moyer has done considerable work in pavement design, driving safety, and road surface characteristics. In addition, he has done much work on the economics of freeways, and the results of his studies have been available through scores of articles, papers and research reports.

CAR MILEAGE

One out of every five cars in use in the United States has been driven more than 80,000 miles.

US 97 Improvement

Dorris to Oregon State Line Unit Completed

By W. H. JACOBSEN, Resident Engineer

The first stage is complete! The initial unit of the Macdoel to the Oregon state line project on U. S. Highway 97, State Route 72, in Siskiyou County was completed on December 7, 1954. With the completion of this contract by Clements Construction Company and Clements Company the first major improvement in Route 72 to modern standards in 20 years has been achieved. The completed section eliminates a serious traffic bottleneck between the town of Dorris and the Oregon state line.

The alignment of the 2.8 miles of new construction followed very closely the old highway alignment and required that the contractor maintain a suitable two-way road for traffic at all times. While this ordinarily constitutes only a normal construction problem, at this location the excavation had to be blasted through large lava boulders laid down by water or ice action. Normal blasting would have closed the road to traffic. In addition to the problem of maintaining traffic was the danger to a main line railroad tunnel belonging to the Southern Pacific Railroad Company which was approximately parallel to the highway for 1,500 feet and below the cut slopes in various places.

Excavation Problems

In this area (known locally as Dorris Hill) was located the largest portion of the excavation. Owing to these two hazards the contractor was obliged to confine his blasting to small shots, which could be cleaned up readily and at the same time cause no damage to the railroad tunnel which had been relined the previous year at considerable expense.

Looking south from Oregon line. The highway posses through cut in the background. In right foreground is turnout.

Showing railway tunnel at the left, with highway passing through cut in center background

The contractor hired an expert seismologist to inspect the tunnel prior to the blasting operations tnd to check on the possibility of structural damage due to the blasting. This was done by using a pin type seismograph placed in the railroad tunnel to determine the effect of passing trains and then the effect of the blasts.

Only that portion over Dorris Hill was built to complete four-lane

. . . Continued on page 58

Looking south from the Oregon state line. Highway and railroad go through the low gap—Dorris Hill—which appears in the distant skyline.

Freeway Vistas . . . .

Motor Trip in South Offers Attractions

THE NEW freeway through Ontario, Claremont and Pomona is by far the most interesting piece of road between Redlands and Los Angeles. At least, that was our impression Saturday while making a round trip.

(The accompanying observations on a recently completed section of the San Bernardino Freeway appeared in the column entitled "With a Grain of Salt," written by Frank and Bill Moore and appearing in a recent edition of the Redlands *Daily Facts*.—Editor.)

Never in modern times has the motorist had such a magnificent view of the California scenery. As you leave the old alignment of Highway 99 in the Guasti vineyards and veer toward Upland, the full sweep of the snow covered mountains stands before you. There is nothing to obstruct your view—bill boards, hot dog stands, or the like—and Mt. Wilson is almost centered in the view.

Splendid View

On the reverse trip, the scene is even more striking since the road rises on a series of fills through Pomona and Claremont. These elevations sweep away the usual clutter of roadside foreground and take your eyes out over the vast orange groves and to the steep and spectacular San Gabriel Mountains.

You suddenly realize that we have been hiding our much-acclaimed California scenery—that thousands of motorists have driven east from Los Angeles without ever seeing the beauty of our land.

We have heard that on the Pennsylvania Turnpike the straightaway driving is so monotonous that tired motorists tend to become inattentive and accidents befall them.

The design of the Ontario-Pomona freeway, with its balance of cuts at one end and fills at the other, was not addressed to the problem of monotony and accidents. But the changing elevations certainly do lend interest and variety.

You are west bound on a road that is at ground elevation. Then it goes down into a big ditch for a mile or two, climbs back to ground level, goes up on a fill, back down to earth, up over another fill, and so on through Pomona.

Saturday Morning Trip

The road is a roller coaster with the ups and downs reduced to a gentle, pleasurable sensation.

It was 9 a.m. Saturday morning when we went through Claremont and the lack of traffic was little short of astonishing. But on a moment's reflection the reason is not hard to find.

The freeway was carrying very little local traffic. Those motorists were to be found elsewhere—on city streets.

On Saturday morning many people are using their cars to go to town for shopping and all of the other errands people do. The commercial district of the city becomes jammed and stays that way.

But on Saturday morning the weekend, holiday traffic is only beginning. The volume doesn't amount to much—not when put on a superhighway.

The visible separation of local and through traffic is something new and striking.

Traffic flows smoothly through the Claremont area, where the freeway is bordered by orange groves, subdivisions and palm trees. Note gentle rise and dip of freeway grade. View is east from Alexander Avenue.

County Road Bridge Designs

Standards Are Steadily Raised With State Help

By W. C. KIEDAISCH
Supervising Bridge Engineer

In the last eight years there has been a marked advance in the design and construction of county bridges. This advance is one of the more valuable results of the Federal Aid Secondary Program and is best illustrated by the excellent structures recently designed and constructed by county engineering staffs.

In allocating the federal funds to the counties, the states were assigned the responsibility of administering the expenditures. In California, the federal aid secondary projects are advertised and constructed as state contracts. This necessitates state standards as far as specifications, project plans and construction engineering are concerned.

All FAS projects are initiated by the board of supervisors through the county road commissioner and outlined in a project report and program. On projects which consist of, or include, a bridge the next step is a field review at the site made jointly by representatives of the Bureau of Public Roads, the Division of Highways and the interested county. At this review, the details of the structure are discussed and, if possible, fixed. Various types of structure suitable for this site are considered and, occasionally, the most economical choice must await estimates based on rough structure quantities required for practical alternate bridges.

Counties Do Good Job

Also at the field review, the county representatives indicate their ability with respect to performing the preliminary and construction engineering for the project and they are encouraged to assume those responsibilities. The counties usually have confidence in their ability to construct satisfactory roadways as controlled by their individual local conditions, but the majority are often wary of the technicalities involved in the design and construction of a bridge. The confidence and experience they have gained when they have performed the engineering on a structure have enabled them to raise the standards of construction, increase the economic life of their projects and they will ultimately reap the resultant financial rewards.

In most instances, the counties have been pleased with the talent buried in their own engineering organizations which was uncovered in the processes of handling the complete engineering for these projects. This talent was then available for use on projects involving county funds only and the result has been to raise the standard of county design and construction.

Cooperation From State

Close contact with the engineering staffs of the counties has been maintained by the Division of Highways to carry out a basic objective of the Collier-Burns Act of 1947 that the counties become as self-sufficient as possible in engineering their projects.

That great advances have been made in this respect is shown by the following comparison.

Of the 20 FAS bridge projects constructed or under construction by June 30, 1947, the counties designed 15 percent and furnished the construction engineering for 45 percent.

Of the 105 FAS bridge projects constructed or under construction by June 30, 1954, the counties designed 44 percent and furnished the construction engineering on 57 percent.

Many Types of Bridges

These bridge projects vary in total contract cost from $9,000 to $637,000. They also range in structure types from widening of a small bridge through movable bridges to those carrying expressways over major streams.

Following Division of Highways practice, two counties have recently initiated an expansion of their engineering organization to include a department primarily interested in recording the data pertinent to their existing bridges, with particular reference to their structural condition and adequacy for traffic. They also propose regular inspections of each structure in the hope that minor repairs will correct a distressed condition before it necessitates major repairs or structure replacement. From this information the counties will be better qualified to determine their present and future needs with respect to structures and distribute their construction and maintenance funds accordingly. As the counties expand this phase of their operations the maps produced for the county by the Highway Planning Survey should prove of great value.

Foundation Studies

Also following Division of Highways practice, the counties have recently tended toward obtaining foundation studies of proposed structure sites in order to ensure the most economic structure design and life. Often the lack of proper subsurface information has caused the destruction of or major damage to a structure long before it would be obsolete for other reasons. These cases can be suddenly embarrassing to the county owner in a political and financial way. Also, the cost of the foundation study is usually returned to the county in the shape of savings in foundation cost and construction.

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Horizontal Drill

New California Approach In Landslide Control

By A. W. ROOT, Supervising Materials and Research Engineer

The avoidance, prevention and control of landslides constitute an important phase of highway design, construction and maintenance in California. There are numerous types of landslide, which have been variously classified according to kind of material, type of movement, causes and a great many other factors.

Probably the most prevalent type of landslide, and the one which is most troublesome to highway engineers in California, is the "slump" type. In this type of landslide the movement occurs along internal slip surfaces, and characteristically the surface cracks are concentric, and concave toward the direction of movement; the top surfaces of the moving blocks or units are often tilted backward toward the slope; the surface of rupture may approach an arc of a circular curve, concave upward, but the shape of the curve is greatly affected by any discontinuities in the material. Most roadway slipouts are slump-type landslides.

Causes of Landslides

The factors or conditions conducive to land movement are numerous, and it is seldom that one "cause" can be assigned to a landslide. Nevertheless, it is generally agreed that ground water is a major contributing factor in the vast majority of slump-type landslides in California. Ground water may act in several ways to induce land movement: the activating forces are increased by hydrostatic pressure or by seepage forces; in the presence of ground water, resisting forces are reduced by pore pressure or by lower shear strengths of the soil.

Interception and removal of subsurface water is often an effective method of preventing or controlling landslides, especially the "slump" type. One method of subdrainage used extensively in California consists of installation of horizontal drains, which are 2-inch perforated pipes placed in drill holes bored into a slope. The drains are usually 100 feet to 300 feet in length, and on gradients varying from 1 percent to 20 percent. Horizontal drains are frequently, but erroneously, described as "Hydrauger" drains. "Hydrauger is the proprietary name of one type of drill used for installing horizontal drains.

One of the principal advantages of the horizontal drain method of controlling landslides is the relatively low cost compared to other methods of stabilization. The use of horizontal drains is restricted to soil formations which can be drilled economically with available drilling equipment. Constant efforts to improve methods and drilling equipment have made possible the economical installation of horizontal drains in all but the most difficult formations.

Hydrauger and McCarthy Drills

For several years all of our drilling was done with "Hydrauger" equipment and some of these units are still in use. Diamond * drill A-rods are used with these drills; all of our earlier drilling was done with fish-tail or auguer-type bits having tungsten carbide inserts. These bits were made up in our own shops. When small size oil-field type roller bits became available we experimented with them and found them greatly superior to the fish-tail and auger bits

* This is a name designating standard core drill fittings, which may be used with any type of drill bit. Diamond-set bits, although used for coring solid rock or concrete, are not normally used for drilling horizontal drains.

UPPER—4½-inch rock bit, 3⅞-inch rock bit, and 4-inch fish-tail bit with tungsten carbide inserts.
LOWER—N-rod coupling and A-rod coupling.

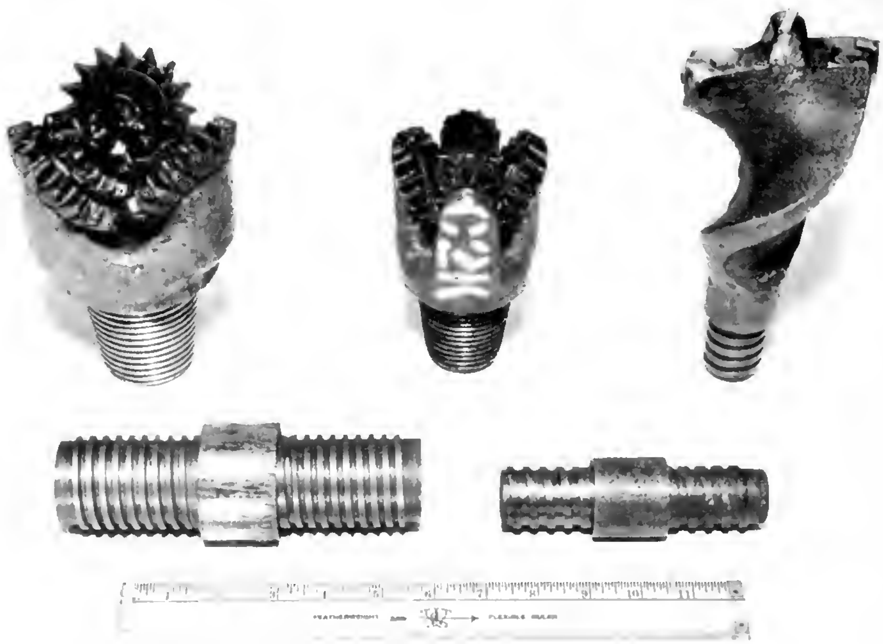


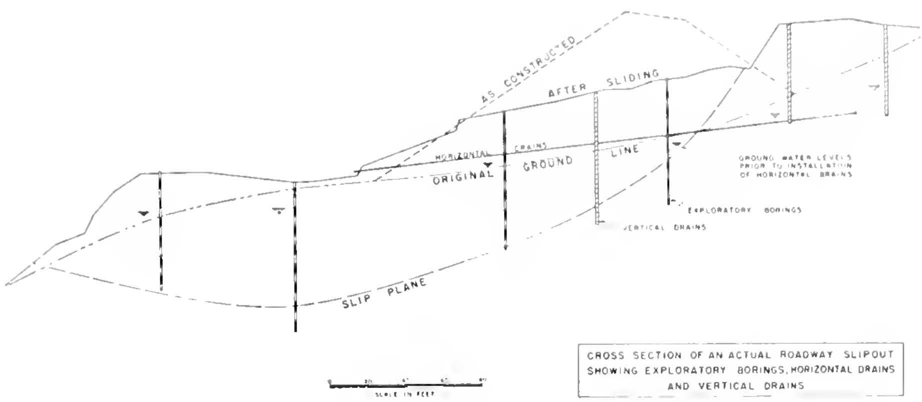
FIGURE 1

for drilling rocky formations. Accordingly, we adopted the roller-type bit for all drilling except in rock-free earth. *Figure 1* shows the rock bits and fish-tail type bit.

Adoption of the roller type bit enabled us to drill to greater depths and through more difficult rock formations which could not be penetrated with the fish-tail and auger bits previously used. But at the same time the more difficult drilling increased power requirements and caused greater stresses on both the drill rods and the drill unit. As a result, breakage of the A-rods became excessive, and it was found that the Hydrauger air motors did not supply sufficient power. The type of drilling which we do with the rock bits appeared to require a more rugged and more powerful drill unit than the Hydrauger which had been used exclusively in the past.

Heavier Drilling Equipment

Our first attempt to use heavier drilling equipment was with the McCarthy Rock Boring Machine shown in *Figure 2*. This drill, which was designed for use with continuous helical augers, drills rapidly in earthy formations, but cannot drill to depths greater than about 150 feet, nor will it penetrate broken rock formations. By means of a water swivel fabricated in Headquarters Shop of the Equipment Department the McCarthy machine was converted to a rotary type drill, using diamond N-rods and a 4½-inch roller type rock bit. *Figure 1* shows the relative sizes of the A-rod and N-rod. The converted machine operated very satisfactorily, and we found that the use of heavier drill rod, the hydraulic feed and superior power all were advantageous. This machine, however, had one serious drawback: when using the machine for forcing the casing into the drilled hole, the casing must be in front of the drill carriage, as the design of the machine prevents working through a chuck; this necessitates using lengths of casing which can be inserted between the carriage and outlet end of the drain at the ground surface. In restricted working areas it is necessary to use five-foot lengths of casing, with a correspondingly large number of field welds. Also the McCarthy machine is somewhat larger and more powerful than necessary for the rotary drilling work on our drain installations, which results in some sacrifice in mobility.



CROSS SECTION OF AN ACTUAL ROADWAY SLIPOUT SHOWING EXPLORATORY BORINGS, HORIZONTAL DRAINS AND VERTICAL DRAINS

Development of Improved Machine

We could find no drill rig on the market designed specifically for drilling holes for horizontal drains, and none which satisfied our requirements. We desired a drill rig incorporating the following features: the drill unit should be complete with a gasoline engine of adequate power; a suitable transmission to permit control of speed of rotation over a wide range; a hydraulic feed with a minimum stroke of six feet, capable of exerting a 4,000-pound thrust; provision for slowly rotating the casing concurrently with the jacking operation when necessary; a chuck readily interchangeable for A-rod, N-rod or casing and so designed that long lengths of rod or casing can be operated through the chuck; rugged but easily operated spuds for maintaining alignment and grade of the drill; rubber-tired wheels and three-point suspension to permit sharp turns; and, finally the over-all length not to exceed 12 feet and the weight of the complete drill to be not more than 3,000 pounds.

New Machine Designed

The Materials and Research Department had for several years realized the need for such an improved horizontal drill, and as no completely suitable machine could be purchased, it was decided to design and build a drill unit specifically for horizontal drilling. Accordingly, the Equipment Department was requested to design and build a machine meeting the specifications outlined above. As a result of this request Mr. Jim Kelcher, equipment design engineer, was assigned by

McCarthy rock-boring machine with helical auger and drill head

FIGURE 2

Equipment Engineer Earl E. Sorenson to do the job. Mr. Keleher, with the cooperation of the author and other personnel of both the Equipment and Materials and Research Departments, began designing the rig in January, 1954. By March, 1954, the final drawings had been completed for a machine having the desired features and meeting our specifications; on June 30th the shop had completed its construction.

The new drill rig, for the most part, is comprised of standard or proven parts or subassemblies similar to those used in manufactured drills. The machine is unique because it incorporates the desirable features of various machines into a light-weight, compact drill rig especially suitable for the type of drilling required for installation of horizontal drains. The power unit is a 20-h.p. Wisconsin four-cylinder, air-cooled engine, connected through a fluid drive to a four-speed Ford transmission. Rotation of the chuck is accomplished by a gear train from the transmission enclosed in an oil-tight housing. The entire drive assembly is mounted on a hydraulically operated carriage with a travel of six feet. A Vickers 10-gallon-per-minute oil pump, driven by the Wisconsin engine, supplies oil to two hydraulic cylinders, by means of which the thrust can be controlled at any desired feed pressure up to 4,000 pounds.

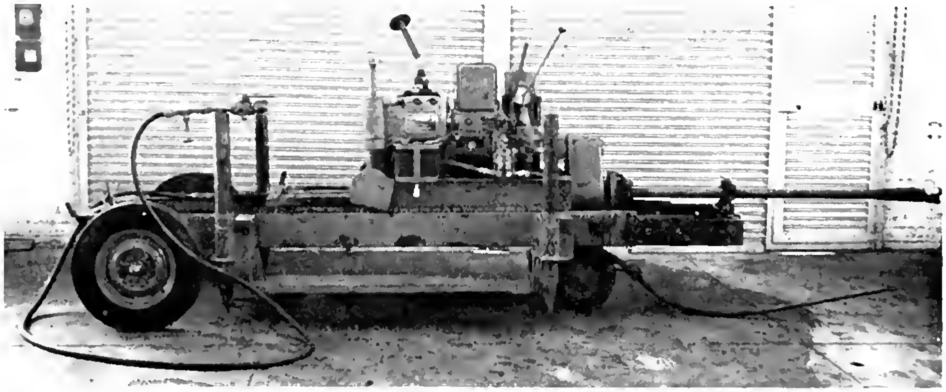
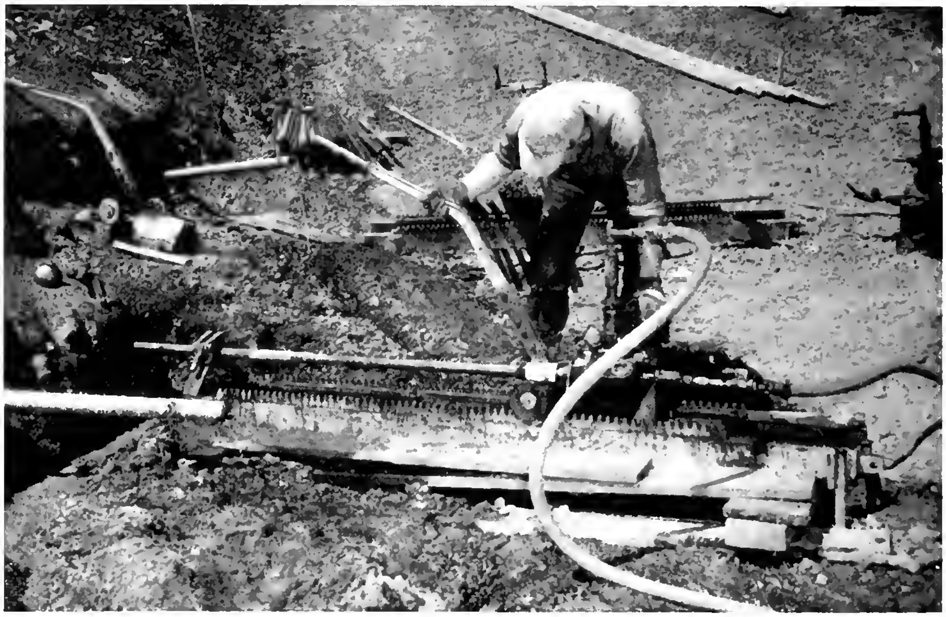


FIGURE 3
California horizontal drill with drill rod and bit in drilling position



Hydrauger drill in operation

California horizontal drill with casing in chuck

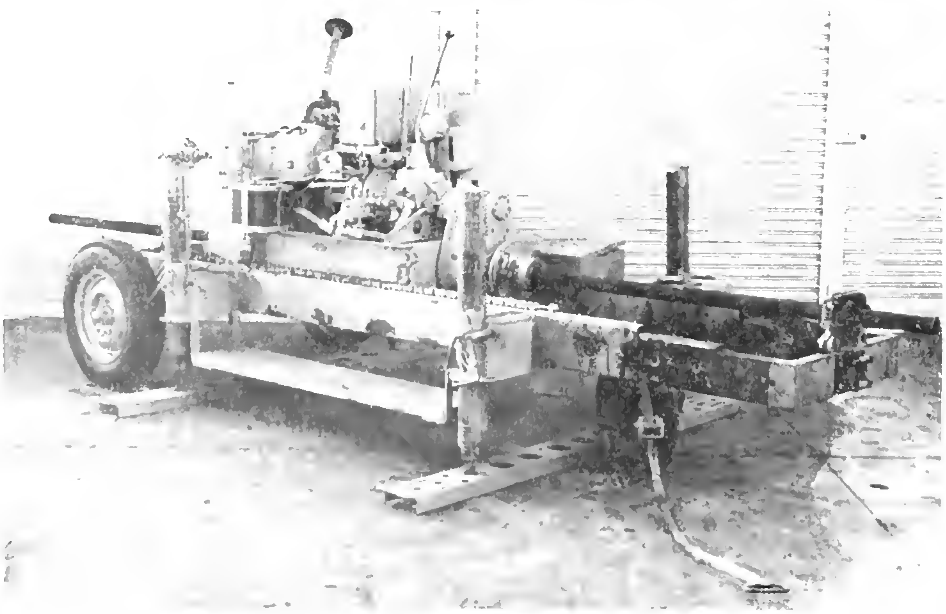


FIGURE 4

Special Chuck Assembly

A specially designed chuck assembly was required to permit the use of long lengths of drill rod or casing, and to provide for interchanging chucks for different size rods. Standard A-rod and N-rod chuck heads are used, with a shop-designed chuck holder which permits quick change of chuck heads. A special chuck for gripping the two-inch casing is used in the same chuck holder. The completed drill rig is shown in *Figure 3 and Figure 4.*

During the design of the machine many difficulties were encountered. Because these problems were solved on the drafting-board rather than by cut and try methods, very few modifications were required after the machine was fabricated. The cost of constructing the drill did not exceed the preliminary estimate.

On completion of the drill rig it was taken to American Canyon on U. S. 40 in Solano County for its first operational test. During this test it performed satisfactorily, and has since been used on two other horizontal drain jobs. One of these installations was in District V on San Marcos Pass where the new California horizontal drill rig was used exclusively. Eighteen drains were installed at this location, five of which were 300 feet or more in depth and 7 others at least 250 feet deep. This drilling was done at a very reasonable unit price, comparatively speaking, and the drains were very successful in intercepting the subsurface water. The ease with which this work was accomplished by the new drill rig was a new experience and a great satisfaction to every one associated with it.

As was expected, operation of the new drill revealed some "bugs"; however, only a few minor changes were found necessary and these are currently being made. The satisfactory performance of this first drill unit and its freedom from defects attest to the soundness of design and the high quality of workmanship. All personnel who participated in the conception, design and construction of this new horizontal drill are to be commended for their ability and efforts.

COUNTY ROAD BRIDGES

Continued from page 25 . . .

The final proof of the value of the program is the quality of the bridges recently designed and constructed by the more rural counties on county roads without any aid from federal, state or other agencies. These examples prove that these counties can, on their own initiative, construct adequate, economical, modern structures which will compare favorably with those constructed by any other agency.

Highway Unit Has Woman Road Planner

Quite a "drawing attraction" they have in District VII of the State Division of Highways here * * *

She is Miss Marilyn Jorgenson, 28, and blonde. She also holds the distinction of being the only fully licensed and registered female civil engineer in the entire state-wide Division of Highways. She is the only woman in the entire division holding a rating of associate highway engineer.

Miss Jorgenson is in the design section of the highway headquarters here. Which means that she designs freeways—ramps, gradings, drainage, rights of way. Everything but bridges. The job also entails estimating, tons of technical reports, and comparative studies. Her immediate supervisor is Jess Reynolds, senior engineer in charge of the design section.

MARILYN JORGENSON

Minnesota Grad

Right now, she is wrestling with a five-mile section of the San Diego (Sepulveda) Freeway in the vicinity of Venice. On this job, she heads what is called a "design squad." In addition to herself, it includes an engineering aide, a delineator, and a junior engineer.

The pretty young woman, of Scandinavian extraction, graduated from the University of Minnesota in 1948 with her bachelor of civil engineering degree.

Why did she take up civil engineering?

"Well," she explains simply, "I like mathematics and I didn't want to be a teacher."

Miss Jorgenson and her parents moved to Los Angeles shortly after her graduation and she went to work for the Division of Highways.

Holds Chapter Office

It wasn't until last summer that she was able to take a two-day examination that resulted in her license as a full-fledged civil engineer. This is because six years' experience is required before an applicant is eligible to take the stiff licensing exam. There were 1,500 applicants taking the test and, as you might imagine, Miss Jorgenson was the only woman among them.

So, they're pretty proud of her over at the Division of Highways. And all her other conferees also must regard her rather highly. They've just elected her secretary-treasurer of the transportation group of the Los Angeles Chapter of the American Society of Civil Engineers.—*Art Ryon in the Los Angeles Times.*

TRAFFIC STRIPING

Traffic lines were painted and maintained on about 11,500 miles of state highways during the 1953-54 Fiscal Year. The cost, exclusive of work performed by cities, was $716,105, including the painting of pavement markings.

BETTER SIGNAL LAMPS

The Division of Highways now uses traffic signal lamps with a guaranteed life of 6,000 hours instead of the previously specified 4,000 hours. This permits replacement of lamps on an eight-month instead of a six-month schedule.

Prestressed Girders

San Bernardino-Santa Ana Freeway Bridge Interchange

By WARREN B. JAMES, Resident Engineer

THE ROUTE 26-2 Separation, which will provide for improvement of the interchange facility between the San Bernardino Freeway and the Santa Ana Freeway is located in the City of Los Angeles in the vicinity of Aliso Street on the easterly side of the Los Angeles River. The existing facilities are lacking in provision for direct interchange for westbound traffic from the San Bernardino Freeway to the Santa Ana Freeway. The new bridge being constructed will provide for this direct interchange.

The interchange structure is built to span the four existing freeway arteries and their two connecting ramps and the rather unusual interweaving of roadways at this point has called for many innovations in design and construction.

Construction work under these conditions presents many interesting problems for both the contractor and the engineer.

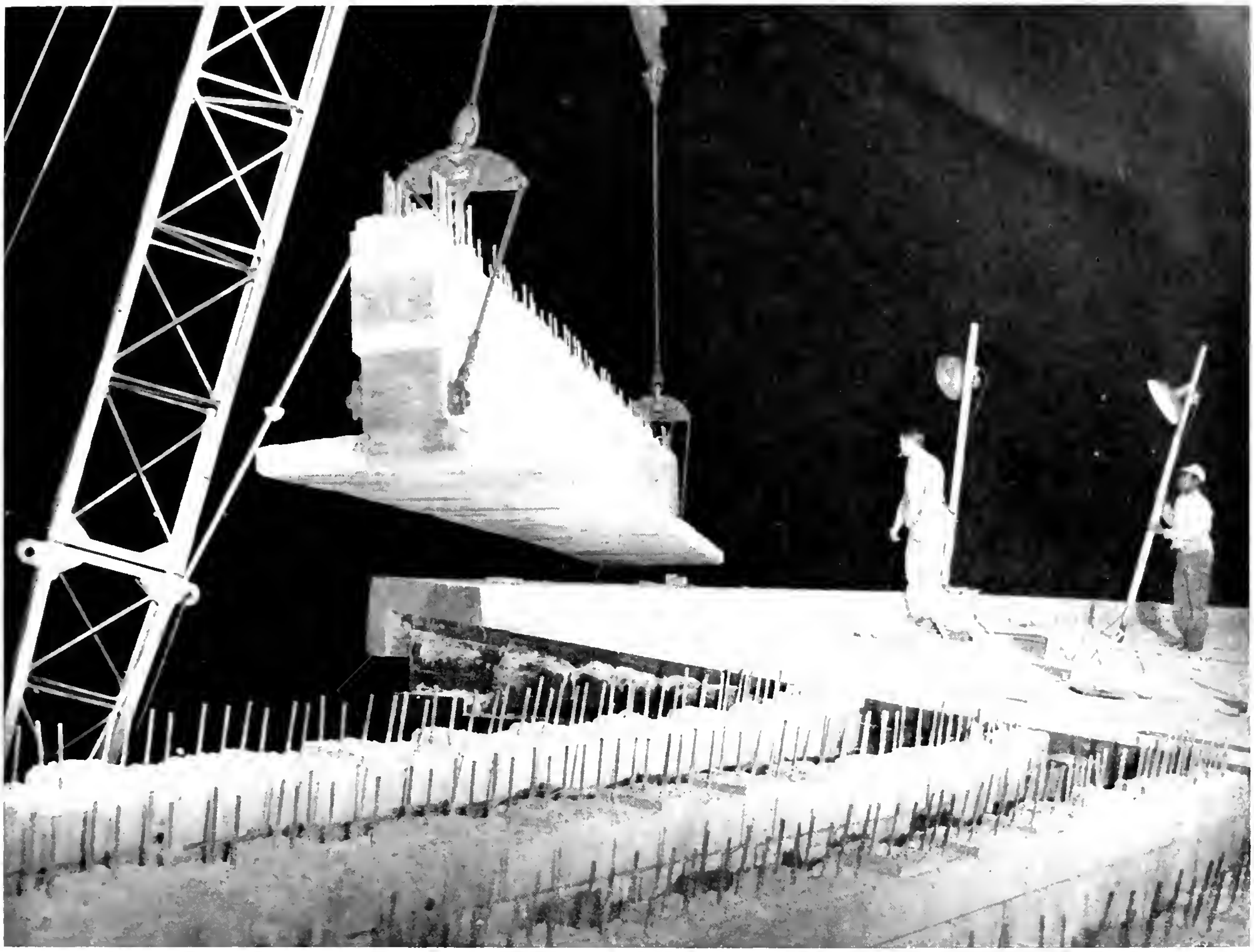
Detours Required

Problems for the contract began with the start of the job. The first was that of providing a detour for the westbound San Bernardino Freeway in a space only wide enough for two lanes of traffic. The limiting factor was the space available under the Macy Street Bridge where the Pacific Electric Railway occupied the major portion of the area with a main line freight track. The need for a three-lane detour to take care of the three lanes of freeway traffic was considered so urgent that conferences were called with the railway to evolve some method of alleviating the situation. The railway finally agreed to move their tracks into a restricted clearance position thereby providing enough space for an additional nine-foot lane. With the resulting 28 feet of width three narrow lanes were provided which although below the standard width of 12 feet, actually handled traffic in a quite satisfactory manner.

Tunnel Walls Removed

The detour was tied in with and was a part of one of the larger contract items, that of removing the top and one side of the old Pacific Electric Railway Underpass for the westbound San Bernardino Freeway. As soon as the above detour was finished and traffic switched over to it the contractor moved in with a battery

General view of the separation as seen from Macy Street Overcrossing



Lifting prestressed girder into place

of 3-inch pneumatic rock drills which were put to work on the side walls of the tunnel and approach. Following this the roof of the tunnel was cleared of earth overburden and a steam pile hammer fitted with a special cutting bit, and handled with the usual pile driving rig, was set on it for breaking up the slab. This top averaged three feet in thickness and was heavily reinforced. The pile hammer and bit broke out the concrete in sizes generally easily handled. About 100 tons of reinforcing steel was salvaged as scrap. The walls, on the other hand, were principally of gravity type and without reinforcing. They varied from about four feet thick at the top to 12 feet at the bottom.

The drills were used to outline the walls in rectangular blocks about six feet square with holes spaced closely together. The outlined blocks were then broken out by use of internal hydraulic jacks which were run into the holes about two-foot centers and expanded. Those blocks which were too large to handle were reduced to size by means of a swinging ball. Due to the proximity of sewers and storm drains the specifications prohibited dropping a ball. In total about 3,000 cubic yards of concrete were removed at a contract cost of over $60,000.

Restricted Working Conditions

One of the most obvious over-all problems on the job was that of limited working space. The only areas available for operations on most of the work were the narrow strips of planting area between the ramps and roadways. Coupled with this, due to traffic conditions, the contractor's operations in the roadways were limited in the daytime to the hours between 9.30 a.m. and 3.30 p.m. and at night from 6.30 p.m. to 6 a.m. He was also restricted from placing falsework in the freeways and in the ramps. His only access to the work was over the congested freeways and all equipment moved from spot to spot had to be flagged through traffic.

The separation structure is 798 feet long between abutments plus 145 feet of a concrete cellular approach structure on the east end. It also included several hundred feet of paving at each

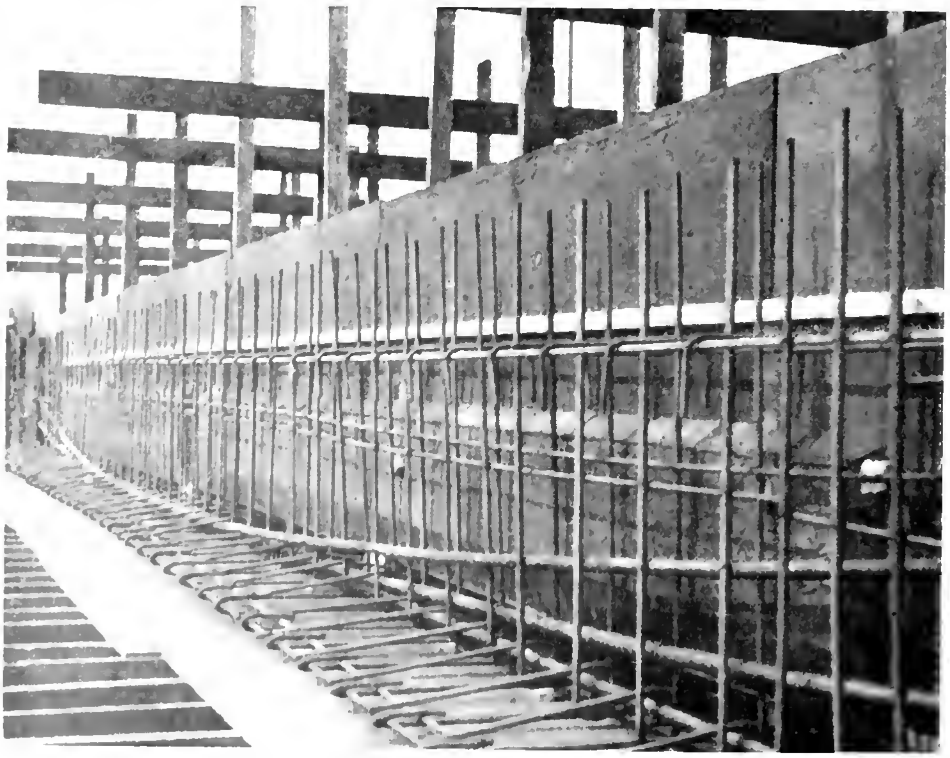
Panorama view of separation structure taken from center of radius point. In center is view of central po

end and beneath the structure. The bridge is 28 feet wide between curbs and is on a 370-foot centerline radius curve. It has a maximum superelevation of 10.5 percent and maximum grade of 8.5 percent. Incorporated in the structure near its center are two prestressed girder spans over the eastbound San Bernardino Freeway and the eastbound Santa Ana Freeway.

Prestressed Girder Construction

The prestressed girders are 48 feet long and 16 in number. They were cast on the ground, prestressed and hoisted into place where diaphragms, facia girders and deck were poured on them. The remaining spans of the bridge were of the usual box-girder type and poured in place. Some of the falsework required for these was over 40 feet high. The deck spans were all supported on single round reinforced concrete columns six feet in diameter.

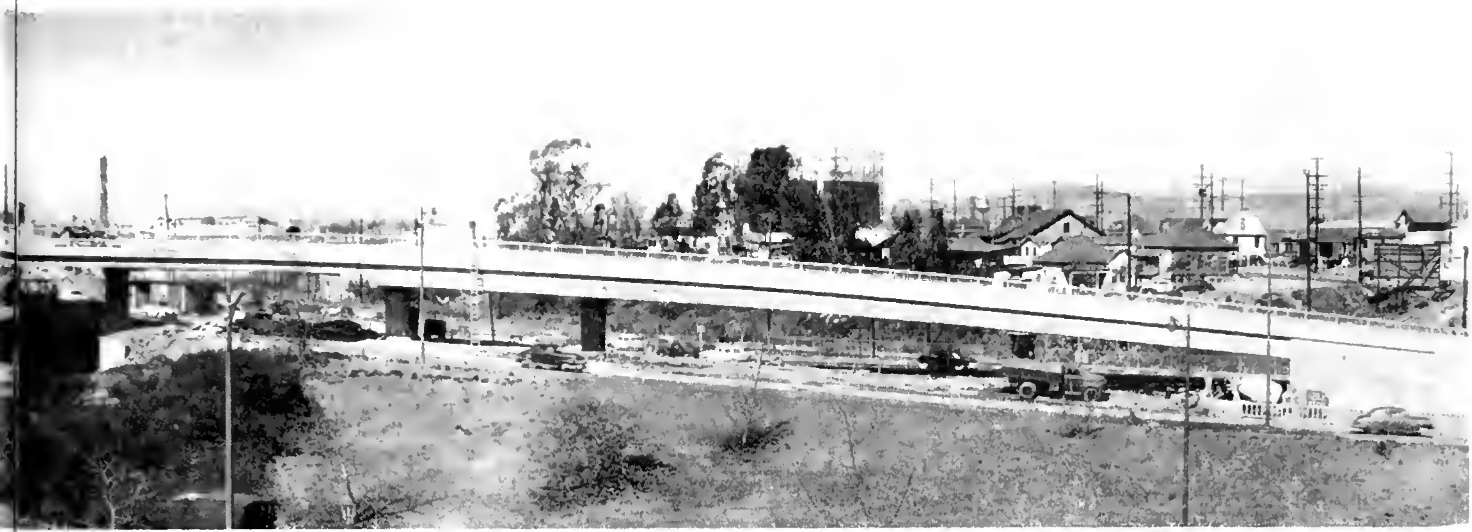
Cables and shear reinforcement



The prestressed girder spans were perhaps the most noteworthy innovation on the structure. They were designed as inverted T-beams on which the deck was to be poured after erection. The bottom flange was 3 feet 8 inches wide and varied from 6 inches thick at the stem to 4 inches thick at the outside edges. The stem was 3 feet high by 1 foot thick at the ends and having a 6-inch wet thickness through the center section of the girder. The stem had step keys on top to key into the deck which together with the protuding stirrups securely bonded the two together. At the girder ends bearing angles were cast in a step at the approximate half height of the girder so that the girder could be hung on the supporting bearings cast in the adjacent spans. These beam bearings were set on the approximate 10 percent superelevation of the deck so that the beams would hang with their bottom flanges parallel to the soffit of the adjoining box girder sections.

High Strength Concrete

The wide and thin bottom flange of the prestressed girders contained ½-inch shear and temperature bars on 12-inch centers which made the girders hard to pour. Both high strength and workability were demanded in the concrete and this was obtained by the use of seven sacks



...idge showing the three levels of freeway separation at this point. Los Angeles City Hall in background.

of cement per cubic yard. A working strength of 4,000 pounds per square inch was obtained and girders were all poured without rock pockets appearing.

Prefabricated and prestressed concrete girders were used over the freeways primarily to eliminate the necessity for falsework in the streets but also the use of concrete carried out a uniformity in line and materials that blended with the rest of bridge. The necessity for keeping the freeways open at all times is quite obvious when viewed at the site. By the latest count, each of the four legs of the freeway carries between 38,000 and 40,000 vehicles per day.

Traffic reaches a peak in the morning and again in the afternoon but is very heavy throughout the day. It lightens somewhat at night particularly after midnight but it still remains a great hazard for contract work due to the increased number of trucks and their high speed. The contractor selected the night period for his girder erection operations on the two spans which he accomplished on two occasions several weeks apart. The eight girders in each span were set in from five to six hours.

Economies Effected

In general it should be stated that prestressed girders save considerably in materials over the conventional reinforced concrete girder designs. The entire depth of the girder is utilized in compression rather than just the top one-third thus allowing the beam to be reduced in section. The required steel is reduced as much as 75 percent for main reinforcement by the use of high tensile steel wire. Although the conventional steel shear bars are still required the over-all steel saving is relatively large.

The prestressed beams on this contract contained three prestressing cables. Two of them contained 10 wires each and the third 12 wires all of ¼-inch diameter and each group enclosed in a flexible metal sheath. These units were equipped at each end with a 4 x ⅞ x 7 inch steel bearing plate and a 2½-inch round by 1¼-inch threaded pulling unit having 5 16-inch holes through which the

. . . Continued on page 36

Prestressed span over the eastbound Santa Ana Freeway bridge and the on-ramp for the eastbound San Bernardino Freeway below, showing the three-level separation at this point. View also shows bottom flanges of the prestressed girders and the general shape of the girder step bearings.

Lexington Dam

State Constructs Curved Spillway Chute Extension

By G. W. DUKLETH, Associate Engineer,
Design and Construction of Dams, State Division of Water Resources

The Department of Public Works, under authority contained in the Joint Exercise of Powers Act, designed and recently completed the construction of a reinforced concrete spillway extension at Lexington Dam. This construction was deemed necessary, and recommended by the Division of Highways' Joint Bank Protection Committee, as the least expensive method of preventing undercutting and possible failure of an embankment on State Sign Route 17 during periods of spillway operation. State Sign Route 17 is the Los Gatos-Santa Cruz Highway.

Lexington Dam, a rolled earth structure 190 feet high, is located in Santa Clara County about one mile south of Los Gatos on Los Gatos Creek. The dam and reservoir are the property of the Santa Clara Valley Water Conservation District. Prior to construction of the dam the state highway ran through the reservoir area. The highway was therefore relocated to pass above the left abutment of the dam and the new road was opened for traffic in December, 1951. The relocation work was financed by a special legislative appropriation.

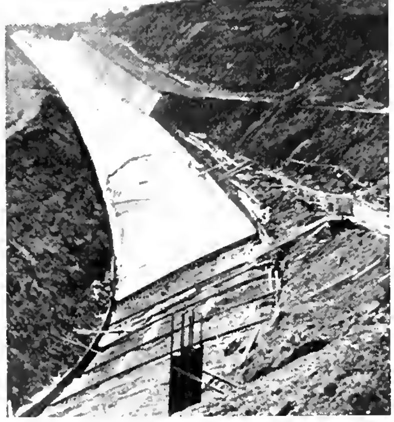
Acting in accordance with state law governing supervision of dams, set forth in Division 3 of the Water Code, the State Engineer gave approval for the construction of Lexington Dam. Construction of the dam began early in 1952 and was completed December 29, 1952. Close inspection of construction of the dam was carried out by the Dam Supervision Section, Division of Water Resources. During the course of construction a large earth slide occurred, the boundaries of which extended into the proposed spillway location, making the spillway relocation imperative. In order to achieve suitable foundation conditions the spillway was relocated nearer the new highway.

Highway Safeguarded

The original concrete lined spillway was designed to terminate in a ski jump or bucket structure on the left abutment approximately opposite

LEFT—Aerial view of Lexington Dam reservoir, with realigned highway on right. RIGHT—This aerial shows realigned highway on left with old highway in center right.


LEFT—Final grading and drain excavation looking downstream. RIGHT—Looking down on flit-bucket terminus of original chute. LOWER—Floor of chute extension about half complete. Looking upstream.



the toe of the dam and near the toe of the highway embankment. The bucket, which directs the water mass in an upward direction, is a device for the dissipation of hydraulic energy.

Impact of the falling water at the toe of the highway embankment, with resultant eddies and turbulence, might well have undermined the embankment and have endangered the highway. Dam supervision personnel recognized the hazard, brought it to the attention of the Division of Highways, and recommended that steps be taken to safeguard the embankment below the relocated highway. The possibility of providing a retaining wall structure was explored by the Division of Highways but was rejected because of the lack of adequate foundation bedrock. It was finally decided that construction of an extension of the originally proposed spillway was the best solution to the problem.

An agreement was reached wherein the Department of Public Works agreed to design and award a contract for construction of the spillway extension and a spillway crossing. As its part in the project the Santa Clara Valley Water Conservation District agreed to secure the necessary rights of way, prepare topographic maps, and amend its application for the construction of Lexington Dam to conform with the revised spillway plans. Sufficient funds were available out of the original legislative appropriation for the highway relocation to finance the extension of the spillway.

The design and specifications for the project were prepared by the Dam Supervision Section of the Division of Water Resources as a party in the agreement. Unusual problems in hydraulic design were involved. From the bucket of the existing spillway, water had to be guided 105 feet vertically and 250 feet laterally to be returned to Los Gatos Creek.

Extension Chute Design

Principles of railroad engineering were used in design of the spillway extension chute. The topography made a short radius of curvature necessary. A compound curve was used beginning with a 180-foot third degree railroad spiral leading into a circular curve of 344-foot centerline radius. Two vertical curves were necessary in the spiral transition.

The spillway, as originally constructed, had an 18.33 percent grade with a bottom width of 40 feet and 11-foot sidewalls on a ½ to 1 sideslope. The bucket was removed and the exposed reinforcing steel bent down into the extension concrete. In the extension section, the bottom width was maintained at 40 feet and the 11-foot sidewalls transitioned to the vertical. The centerline grade was a maximum of 28.5 percent. The length of the reinforced concrete extension lining was 424 feet. The curved and superelevated extension chute drops the water 50 feet. From the end of the concrete lining there is a free fall of 55 feet into the streambed.

The steep grades produced a maximum flow velocity of about 75 feet per second which with the short radius of curvature required a highly superelevated chute floor slab. The superelevation, a function of the velocity and of the radius of curvature, is nowhere constant from one cross section to another. The flow characteristics are those which exist in a free vortex where the velocity multiplied by the radius is equal to a constant. Since the elevation of the floor slab is established from velocity head considerations, the cross section superelevation becomes parabolic in shape. The maximum average superelevation is 1.88 horizontal to 1.0 vertical.

Sidewall Height Determined

The superelevation for the spillway extension was designed for a flow of 10,000 cubic feet per second as a median flow condition. The original spillway structure was designed for a maximum flood flow of 20,000 cubic feet per second and this flow

View of completed spillway extension

was analytically routed through the extension to determine the necessary sidewall height and proper functioning. Similar determinations were made for low flow conditions.

In conditions of high velocity flow, swelling of the water mass occurs due to air entrainment. A conservative entrainment factor of 30 percent was used to account for both swelling and wave action and in determining the sidewall freeboard.

Shallow concrete shear blocks set below the grade of the floor slab and sidewalls in the spillway extension act as keys to prevent movement of the structure on the steep grades. An extensive drainage system is used to eliminate uplift forces.

A short single lane reinforced concrete bridge, designed for heavy maintenance equipment loading, crosses over the spillway extension. The bridge makes it possible to reach the dam which would otherwise be isolated from the highway during periods of spillway operation. A T-beam deck structure continuous over four supports was used. The main central supports are T-stem columns.

The Division of Highways opened bids for construction of the spillway extension on July 14, 1954. The construction firm of Dan Caputo of San Jose was awarded the contract for a low bid of $93,920.

Difficulties Encountered

The construction was difficult both in excavating to the superelevated grade and in the placing of concrete on those grades. In forming for the slab, screeds were set at 20-foot intervals and strike off made on such centers where possible. The warp in some panels made it necessary to set dummy screeds at five-foot intervals. The concrete was vibrated until it started to flow down the slope. Strike off was made by manually pulling the strikeoff board up the slope. An unsuccessful attempt was made to pull the board up the slope by winching.

Concrete was made at the site utilizing imported dry batches and a mobile mixer. Placement was by the use of a truck crane. An air entraining agent was added to the concrete for greater durability, water tightness and workability.

Field personnel of the Bridge Department, Division of Highways, directed the execution of the contract.

SALES TAX ON OIL

Californians paid $3,522,000 in state sales tax on automotive lubricating oil in 1953.

PRESTRESSED GIRDERS

Continued from page 33 . . .

high tensile wires were threaded and held from pulling out by heads cold pressed on the wires. This assembly was completed in the shop and the units were received in the field ready for installation in the forms. This method was very good from the standpoint of assembly in the field although it did lack some of the flexibility of certain other prestress methods. The ease of stressing cables and the positive check on the stress afterwards was very good.

Stresses Applied and Checked

Cables were stressed after the concrete had reached a strength of 3,500 pounds per square inch as indicated by test samples. Two hydraulic jacks of 50-ton capacity were used, one on each end of the cable. They were fastened to the cable by means of the threaded pulling unit or stressing washer enclosing the wires. Jacking was done simultaneously with both jacks keeping them balanced to avoid displacement of the cable longitudinally in the girder. A maximum of approximately 35 tons to 40 tons was placed on the cable depending on the number of wires enclosed. Shims of predetermined thickness were inserted behind the stressing washers and the stress transferred to them by releasing the jacks. Where for various reasons a variation in thickness of shims was found necessary there were ⅛-inch and ¼-inch shims applied.

Pressure gages on the jacks gave a check on the stress being applied and the balancing of stress on each end offered a check between jacks. After the cables were stressed the void in the sheath around the wires was filled with a neat cement grout (without sand) at from 60 to 100 pounds pressure. The final operation was to cover the ends of the cables by filling the recesses in the ends of the girder with a cement-sand dry pack. Levels taken on the girders during stressing operations revealed a rise at the center of only ⅛ inch. This indicated a relatively stiff member which quality was also borne out during the later handling operations.

. . . Continued on page 63

Improvement

Highway 99-97 Cutoff Is Completed Under FAS Program

By OREL E. LEWIS, Siskiyou County Road Commissioner

COMPLETION of the 19-mile cutoff route between U. S. Highways 99 and 97 in Siskiyou County marks another chapter of highway progress in the northernmost region of California.

Destined to become one of the major highway links along the southern fringes of the northwest territory, the route as early as 1833 was used as the north-south route by trappers with the Hudson's Bay Company. Later it was used extensively by wagon train parties migrating into the area via the Immigrant Trail and the Military Pass Road. Even before the 1800's, the ideally located pass between a maze of buttes and mountains developed into the natural trail crossing junction of the Pit and Shasta Indians.

With a substantial portion of the construction cost having been borne by federal-aid secondary funds, the 22-foot wide, asphalt-surfaced thoroughfare now stands as a monument to highway construction programs of recent years. Driving with ease across this stretch today, one would hardly believe the highway is the culmination of more than 100 years of violence, sacrifice and road building under the most adverse conditions.

Wagon Road Begun

Just about 20 years after the passage of the Hudson trappers through the Sheep Rock country, now the location of the eastern end of the cutoff, Colonel James L. Freanor and a group of surveyors undertook construction of a wagon road near the site of the present cutoff. The road was designed to provide a route into Yreka from the more southern Pit River trail which led into Red Bluff. Work was discontinued after only slight progress when in 1852 five members of the survey crew were massacred by the Pit Indians.

Despite the ever-present danger from both the Shasta and the Pit Indians, the route around the base of Sheep Rock remained the preferred passage from the south into Oregon. It also continued as the established trail for those migrating west into Northern California. In 1855 Sam Lockhart led a wagon train of migrating Mormons through Yreka, across the trail which is now the Highway 99-97 cutoff, and down the Pit River trail into Red Bluff.

By that time Sheep Rock was a well established landmark for migrants traveling in all directions throughout Northern California and Southern Oregon. The rock is plainly visible from the left side of U. S. Highway 97 when traveling north from Weed. It is located about 12 miles north of weed.

Rugged Terrain

Evidence along the top of the 1,700-foot high rock indicates that immigrants on some occasions missed the pass and took the more difficult route to the plains leading into extreme Northern California points and in Southern Oregon. Until recent years, trees with deep rope burns stood atop the rock to proclaim that a wagon party had missed the pass when moving southward. The Soule party in 1851 pushed up the north side of the route and deep-burned the trees when lowering their wagons down the south slope with ropes. The Soules still live in the area, now working one of the prosperous Shasta Valley ranches along the cutoff.

Beginning in 1856, the California-Oregon stage lines established routes through Shasta Valley and the present site of the cutoff highway. Due to constant Indian threats and intermittent killings, the schedules were not regularly maintained and were discontinued several years later.

Had Many Names

By 1857 the Shasta Valley Route, then known as the Pit River Road and now as the Highway 99-97 cutoff, was heavily traveled as the main north-south route in California. In that year the Government assisted with advancing and maintaining the road, charging Judge A. M. Roseborough with laying out its alignment. It became known as the Military Pass Road, and it seems paradoxical that the road's decline should begin only a few years later.

Before 1865 the Scott Mountain Road was in use, affording a passage from Shasta, California, over the mountain into Callahan, through Scott Valley and into Oregon. At the same time the Sacramento Canyon road was brought in, leading traffic from what is now Redding north through Yreka and into Oregon. Also, the Trinity road came into being about that time.

In 1862 the *Shasta Courier*, a Shasta County newspaper, predicted the abandonment of the Military Pass Road. It was right.

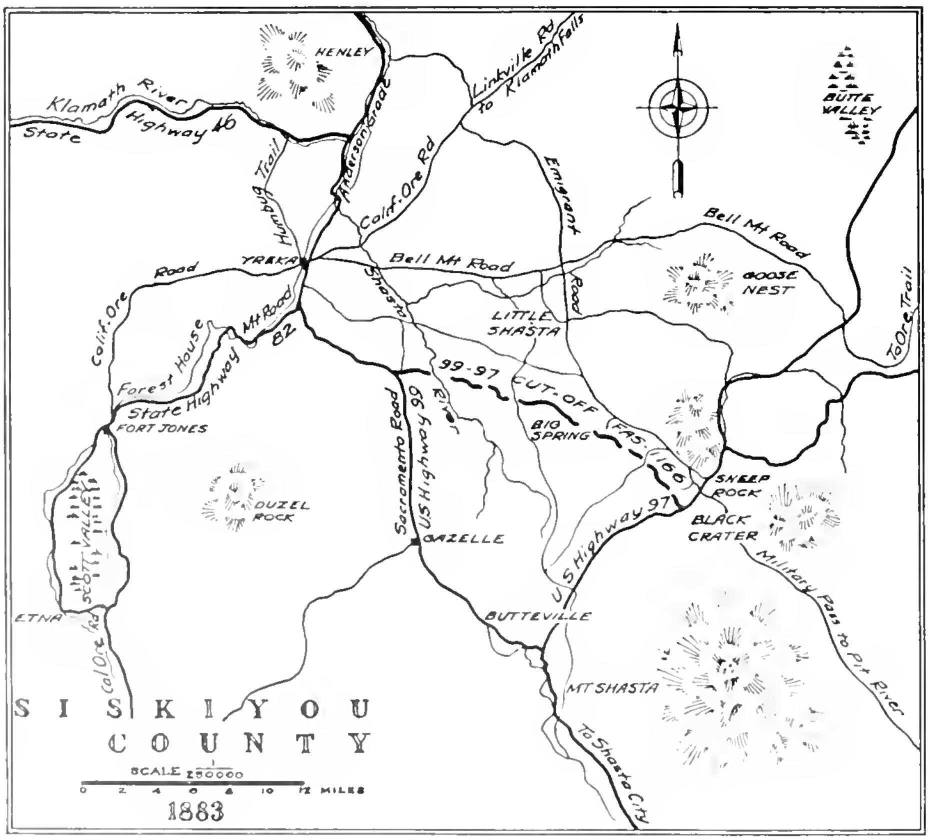
There were a few settlers at that time in the sea of sand and junipers lying between what are now U. S. Highways 99 and 97, but it was only with the utmost difficulty that they maintained their homesteads. Travel decreased on the Pass Road and it reverted to a brush-grown trail.

Becomes County Road

The rebirth of the cutoff as a needed wagon trail came in the 1880's when the railroad pushed north and into Oregon. With the advent of the railroad was born the town of Grenada, now located on the 99-97 cutoff about nine miles south of Yreka. Settlers began moving into the Shasta Valley in greater number, the Military Pass Road skirting Sheep Rock regained some of its former life and lustre and shortly after that the

View of recently completed FAS Route 1166, in Siskiyou County, showing typical farm area served

Map of early immigrant trails through Mt. Shasta area. Present location of Highway 99-97 cutoff (FAS Route 1166) is superimposed near center of map.

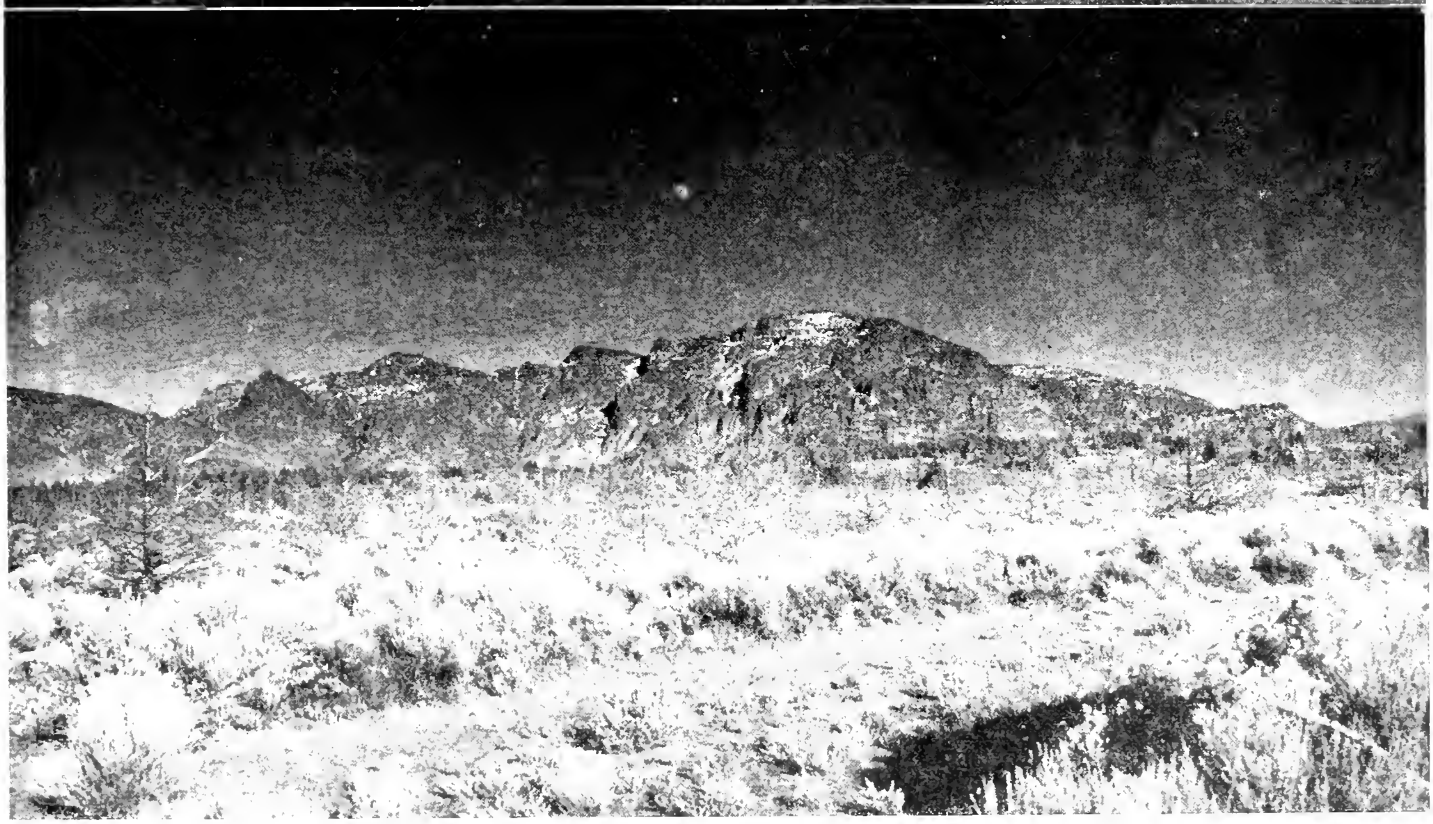


road was incorporated in the Siskiyou County road system.

Although improved and maintained by county road districts through the years, the route remained dirt-top until the mid 1940's. At that time, about half its length was oiled. The first concentrated effort for the realignment and resurfacing of the road was undertaken in 1947. County maintenance crews, hindered by insufficient heavy equipment, struggled with the project until 1951. At that point, the Siskiyou County Board of Supervisors authorized formation of a construction crew to be part of the county road department. Later, the route gained recognition as a federal-aid secondary highway, and construction was greatly speeded up by supplementing the day labor grading operations with contracts for the surfacing and bridge construction.

A Boon to Ranchers

Principal difficulties with realignment included heavy cuts through solid lava rock formations, with extensive fills along the 19-mile route. The road now provides a much im-



UPPER—View of recently completed Highway 99-97 cutoff in Siskiyou County, showing snow-covered Mt. Shasta in background. LOWER—View of Sheep Rock near the westerly terminus of Highway 99-97 cutoff. This landmark was used as a guide for many of the early settlers of Northern California and Southern Oregon.

proved farm-to-market route for the thriving crop and cattle ranches of Shasta Valley, in addition to shortening the paved highway route between Yreka and Klamath Falls, Oregon, by 13 miles.

Although heavy trucking is not permitted over the road at this writ-

. . . Continued on page 43

Sweetwater Road

Pioneers Route in Mono County Is Transformed

By GEORGE E. GRAY, Assistant Highway Engineer

With the recent completion of the contract covering 8.2 miles of F. A. S. Route 580, near Bridgeport in Mono County one more relic of the "horse and buggy" days has faded into the past. A narrow, winding road has been transformed to meet modern standards. Until this contract, the alignment and grades had changed little since the sounds of "gee" and "haw" echoed through the canyon. The impression was extremely bad when compared with the high speed highway which was constructed by the State of Nevada and joined this road at the state line.

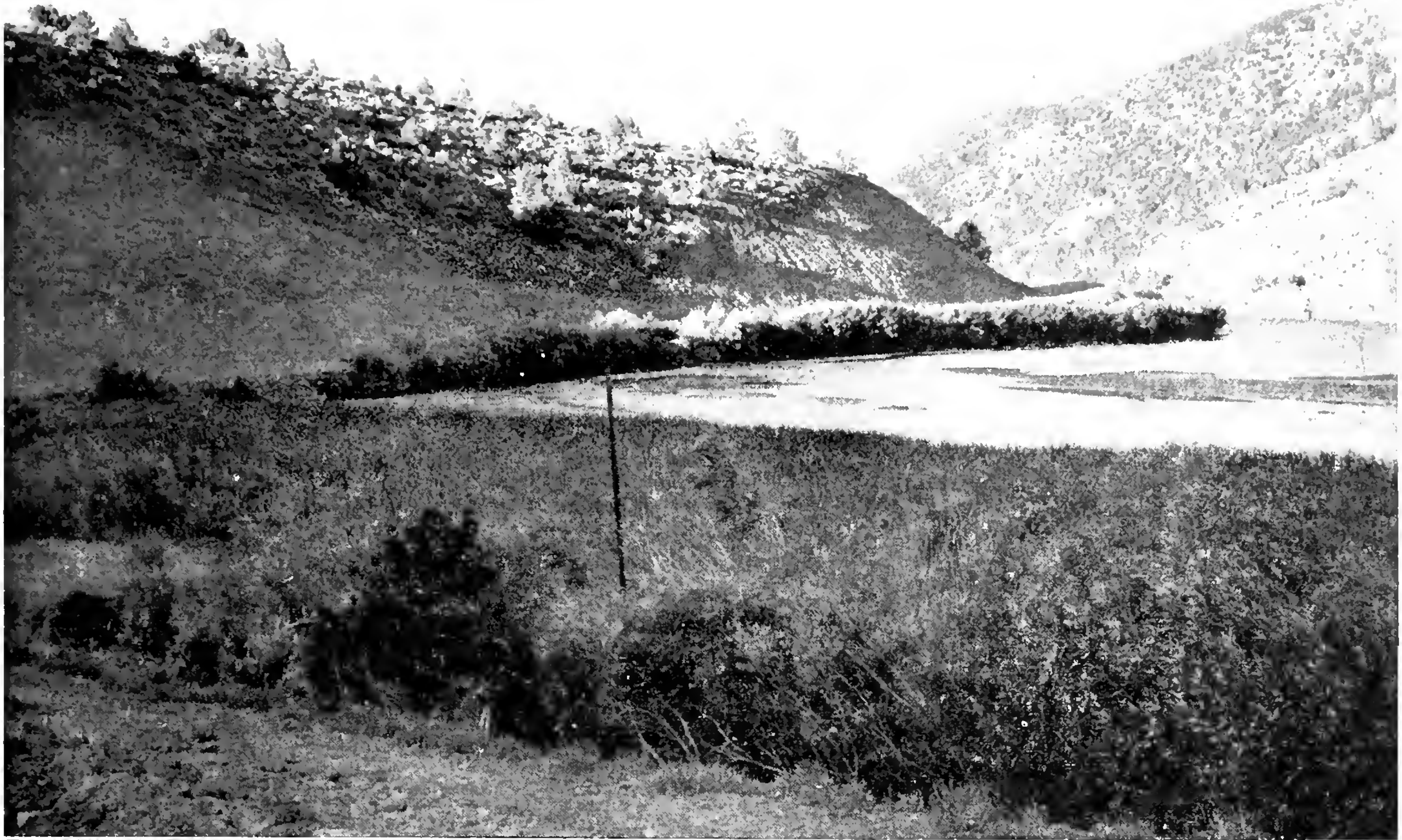
The Sweetwater Road, as it is locally called, extends from Bridgeport, the county seat of Mono County, to the Nevada state line. It follows the East Walker River over this distance and traverses some fairly rugged country. The surveying problems were described in the September-October, 1953, issue of *California Highways and Public Works.*

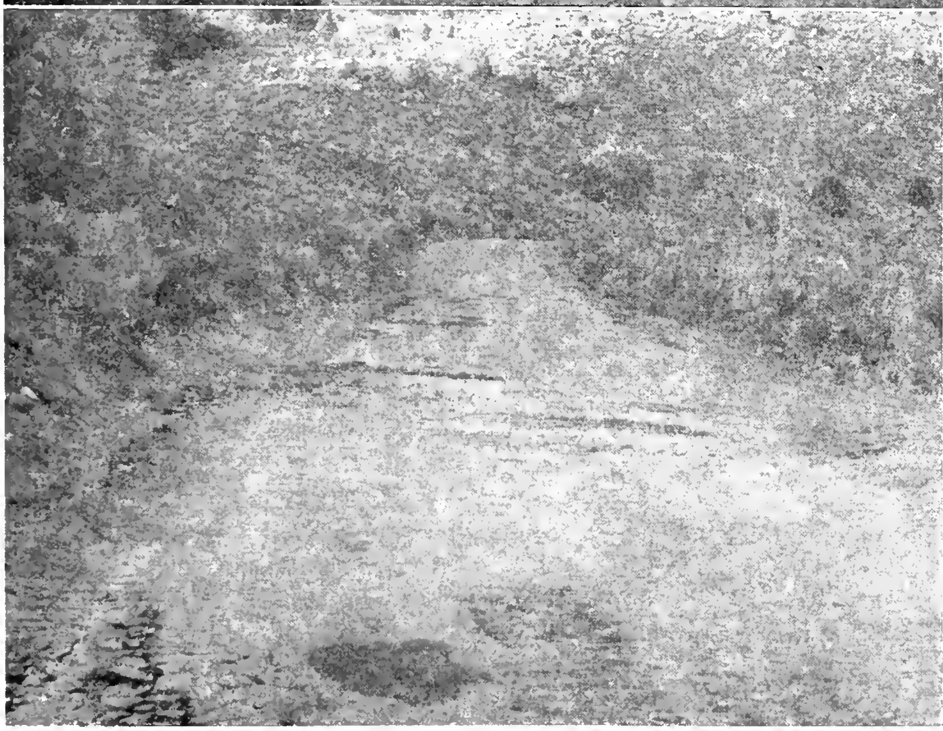
Faster Route

This route connects the rapidly developing copper center of Yerington, Nevada, with the Bridgeport area. Since the only major means of transportation in this section of California is by highway, cattle, lumber, mining products and supplies, as well as items for local consumption, are handled by truck. A good percentage of this trucking uses the Sweetwater route. Now that the highway has been improved, the traveling public can cover the eight miles in approximately 10 minutes instead of the 30 minutes previously traveled.

The contract for the first part of a two-part stage construction was awarded to the firm of Scott, Stecker and Croft. It consisted of roadway excavation, five channel changes where the proposed alignment and the East Walker River conflicted, the laying of imported base material and placing penetration type oil to hold the road until the second stage is started. The usual clearing and grubbing, structures, fence, etc., were also part of the contract. The ulti-

This photo shows channel change on East Walker River





UPPER—New alignment around pond on East Walker River. LOWER—This photo shows an example of original alignment.

mate plans call for 3 inches of road-mixed surfacing laid on from 0 inch to 9 inches of additional base material.

One of the problems was traffic control as there were no available detours on the majority of the project. Changing a goat trail into a modern highway is difficult enough, and keeping it open to the truck and car traffic, herds of cattle and flocks of sheep during the process, requires some extra ingenuity and considerable patience.

The clearing and grubbing consisted of removing brush, willows and pinon pine which offered little resistance to a cat with a brush attachment.

The roadway excavation was handled by using tractors and scrapers on the short haul work and a 1½ cubic yard shovel and trucks for the long hauls. The deepest cut was approximately 40 feet and the fills were up to 25 feet high. In some areas considerable rock was found in the alluvial deposits. This rock created special problems for the equipment as the track pads received heavy punishment. The difficulty was solved by using special manganese track pads. The metal in these track pads is self-hardening and, according to the contractor, this increased the pad life three-fold.

. . . Continued on page 49

Carpinteria Expressway

On the morning of December 7, 1954, traffic began to flow around Carpinteria on a new expressway facility which closed the last gap in the four-laning of U. S. Highway 101 from the Ventura county line to the City of Santa Barbara. However, the progress of improving this route in this area has not stopped here as another contract is already underway to build a freeway through Montecito to eliminate the undivided four-lane highway.

The new construction between 1.0 mile east of Carpinteria and 0.5 mile east of Arroyo Parida provides 3.4 miles of four-lane divided expressway with grade separations at major intersections serving the Carpinteria community. By way of contrast the old road was three lanes except through the main business district of Carpinteria where only two lanes of traffic were provided. The 9,000 cars per day that will use this new expressway will benefit from the saving in time, and operating costs that this facility affords.

Two Contracts

Construction of this project was accomplished under two separate contracts. The first contract was awarded on April 1, 1953, to Fredrickson and Watson Construction Company of Oakland, California, for the sum of $1,085,489. This contract was for the construction of seven reinforced concrete bridges and three reinforced concrete overcrossings; grading of the four-lane divided roadbed, ramps and frontage roads; construction of an underdrain and storm drain system; and surfacing of certain ramps and frontage roads required for local traffic.

The seven bridges consist of three twin, concrete slab deck bridges for crossings over Carpinteria Creek, Franklin Creek and Santa Maria Creek and one frontage road bridge across Santa Monica Creek. At Casitas Pass Road a concrete haunched slab deck overcrossing was constructed. The other two overcrossings at Linden Avenue and Seventh Street are concrete box girder construction.

Carpinteria Expressway, looking east. Seventh Street Overpass in background.

Grading Operations Complicated

Grading operations were complicated by wet soil conditions along this project, particularly between Carpinteria Creek and Linden Avenue. The ground water elevation was above the proposed profile grade so it was apparent that control of the water table would be necessary before any excavation could be accomplished. Therefore, the contractor's first operation consisted of digging deep ditches along the sides of the cuts to lower the water table. A 1½ cubic yard dragline was used to remove the saturated material from the ditches which was transported in trucks to the fill areas where it was spread out in thin layers to reduce the moisture content.

After the water table lowered, excavation was accomplished with rubber-tired scraper equipment assisted by pusher tractors. However, this equipment would mire down easily so it was important that the interception ditches be kept well below the line of excavation and that the water have a free outlet. At times it became necessary to delay for several days between successive cuts to allow the water to drain out of the area between the interception ditches.

Embankment Construction

Saturated soil conditions also complicated embankment construction which existed in the vicinity of Linden Avenue, around Seventh Street, and in the general area of Cravens Lane. The natural ground elevation of these areas is so close to sea level that ground water nears the surface at times and removal of this wet material and drainage ground water was not practical. In order to support heavy equipment for the construction of embankments in these areas it was necessary to end dump the first lifts as compaction of the original ground had to be eliminated because pumping action occurred under heavy equipment.

This condition was further aggravated by the embankment material which was obtained from the aforementioned wet cut area and contained moisture in excess of that amount that would cause sponging action in the embankment layers. It, therefore, became necessary to utilize a long section of the fill bed for spreading out this saturated material. The concentration of the spreads in limited areas was avoided, and hauling equip-

Looking west on Carpinteria Freeway. Franklin Creek Bridge in foreground and Seventh Street Overpass in background.

ment was routed over long sections of the fill upon which new layers of the wet material had been spread in thin courses. The sponging of the embankment under loaded equipment lessened with the length of time that the loaded equipment was routed over it. The moisture gradually pumped to the surface under the equipment traffic and by the end of the fall period of 1953 the new embankment had reached a state of stability.

Unstable Soil

The unstable nature of this soil also caused other complications, notably in the drainage facilities. Cave-ins, sloughing and adverse conditions encountered during the installation of culverts, storm drains and underdrain systems impeded the work and in some instances required changes in the work as planned.

In spite of these adverse conditions the contractor completed the contract in February, 1954, 25 days ahead of the date for completion.

The second contract for paving was awarded shortly thereafter on April 1, 1954, to the Griffith Company of Los Angeles on their bid of $742,858. This contract called for paving the freeway lanes with portland cement concrete on cement-treated subgrade; surfacing the freeway shoulders, frontage roads and ramps with plant-mixed surfacing on cement-treated base; and applying seal coats.

J. C. Adams was resident engineer on both contracts and R. M. Herbert was the Bridge Department representative. Superintendent for the Fredrickson and Watson Construction Company was Bernard Fredrickson, and T. W. Oglesby was the superintendent for the Griffith Company.

Looking west. Carpinteria Creek Bridge in foreground and on-and off-ramps for Carpinteria connecting to Casitas Pass Bridge.

IMPROVEMENT

Continued from page 39 . . .

ing, the route will constitute a major boon to west coast trucking when the existing Shasta River Bridge has been replaced with a legal load bridge of reinforced concrete on pile bents. The new bridge, expected to be completed during 1955 under the federal-aid secondary program, will be 120 feet long and 26 feet between curb faces.

Upon completion of the new bridge, the total cost of reconstructing the 19-mile long route will have reached an approximate total of $670,000.

The federal-aid secondary program is, under federal law, a three-party cooperative arrangement between the Bureau of Public Roads, the State Division of Highways, and the county. As we understand the objective in California, emphasis is placed upon a maximum of county initiative consistent with federal requirements that the completed project be adequate for the existing or expected traffic, serviceable in all weather, and maintainable at reasonable cost.

The county acknowledges, with sincere appreciation, the cooperation of the Bureau of Public Roads and the Division of Highways engineers.

Sacramento Featured in New Motorland Magazine

Sacramento and the region of which it is the economic, cultural and recreational center are featured in the first issue of the California State Automobile Association's larger, redesigned *Mortorland* magazine.

A full color view of the capitol dome appropriately forms the new magazine's cover and there are numerous color and black-and-white illustrations inside, all dealing with some phase of Sacramento region resources or activities.

The CSAA announced that for some time to come each edition of *Motorland* would be devoted to a particular region of the State, with attention given not only to present scenic and recreational values but also to highlights of the region's historical background and its economic assets.

A Random Sample

Panning for Gold Unique Task For Materials Department

By WILSON R. MORRILL, Assistant Physical Testing Engineer

> **FOREWORD**
>
> The full value to the State of the extraordinary expedition described in Bill Morrill's article may be guessed by the reader when he understands all the circumstances.
>
> Other owners along the river were advancing high claims for "gold value." We suspected still others were planning to do so. After our consulting mining engineer, Ezra Erich, had surveyed the area to find the most promising of all the possible deposits, we organized the strange safari Morrill describes. Before Hislop's crew had finished their work, the gold claims were becoming so much conversation and presently we heard little more about them. Instead of trying a series of expensive condemnation cases, we made rapid settlements. Our total expenditure was less than it would have cost to try the case in court, for we would have had to do precisely the same work in preparation for trial.
>
> CLARENCE G. PIPER
> District Right of Way Agent

Many of the projects in District II are unusual. They demand *unusually hard work* to be done in an *unusually short period of time* under *unusual weather conditions* in *unusually remote areas of civilization* with an *unusually rugged terrain*, matched only by the *unusual ruggedness* of our Materials Department and personnel.

Since we can't enumerate all of our projects, we have singled out one that meets all of the above conditions and one which we hope will make interesting reading for our fellow random samplers.

Back in the winter of 1952 our Materials Department was assigned the task of evaluating the gold-bearing potential of a gravel bar on the Klamath River. This project was instigated by the Right of Way Department which had become involved in a potential lawsuit while negotiating purchase of right of way over the gravel bar.

This project was located on Sign Route 96 in Siskiyou County between Horse Creek and Walker Bridge on the Klamath River approximately 25 miles downstream from Highway 99 north of Yreka.

The existing highway between the limits of this job traversed the south side of the river, whereas the new line was on the north side. This presented the problem of getting our equipment in to the bar, five miles downstream from Walker Bridge. There was a so-called road over the first three miles which could be negotiated by a jeep or "cat." The remaining two miles were over an unimproved cow trail, negotiable only by ground squirrels and materials men. The contract had been let to Natt McDougall Company; however, they had not pushed a pioneer road through and the time element did not allow us to wait for such.

Strange Equipment

This type of expedition called for many pieces of equipment that weren't at our immediate disposal. We borrowed some equipment from a mining company, made up part of it ourselves, and made special purchases to obtain the rest. When we assembled all our equipment, it looked like an expedition departing for the far north. The equipment included a set of caissons, a 10-foot sluice box, and air-driven hoist, and air-driven water pump, a 3-inch suction water pump, many feet of hose and connections, a tripod, two 20-foot ladders, a wheelbarrow, two wash tubs, and many miscellaneous pieces of equipment such as ropes, buckets, picks, shovels, lumber, wrenches, oil and gasoline. Our mobile equipment included an FWD which we rented from the maintenance department, an air compressor and one Chevrolet station wagon.

The personnel consisted of three materials men—Joe Hislop, Bill Morrill, and George "Smooch" Moss; one miner, Jim Bassham; and one consulting mining engineer, Ezra Erich.

One of the more stable areas on the way out

We left the Walker Bridge Maintenance Station at 8 a.m., March 11th with the FWD loaded to the hilt and pulling the compressor. Joe was at the helm attempting to herd this monstrosity toward our destination. I walked ahead and guided him around, over, and through the rough spots. Our first worry was the crossing of Doggett Creek. After sizing up the bridge we eased across. Fortunately, the contractor had a "cat" on the job and he pulled us through several spots of deep mud and steep sidehills which we could not otherwise have navigated. One broken water pipe en route cost Joe $5 for repairs. After seven hours of sloshing, sliding, bouncing, shoveling, chopping and straining, we arrived at our destination, 4.6 miles from point of departure.

Headquarters at Streamwood

For the duration of this job we made our headquarters at Streamwood Lodge, located about one mile upstream from Walker Bridge. Incidentally, one of the bright spots of this project was the food at Streamwood Lodge. It was served family style and we have never seen the equal of the quality and quantity anywhere in the district before, or since.

We traveled to and from the job each day in the station wagon over the existing highway to a point about one-quarter mile from the job and on the opposite side of the river. From this point we negotiated a 200-foot river crossing on a rickety hand-propelled "cable car" which left a lot to be desired for over-water transit of nonswimmers. Jim Bassham was in this category and before the job was over he was giving serious thought to a daily nine-mile round trip hike on the job side of the river. Of course the thrilling extra bounce that some of the fellows put in the cable, causing the car to dip to within a couple of feet of the roaring Klamath River, didn't seem to comfort Jim in the slightest.

The job that confronted us, as laid out by Mr. Erich, was to sink several shafts through this gravel bar to bedrock. All of the material that we excavated had to be washed through the sluice box and panned to retain all gold removed, for evaluation purposes.

UPPER—Jib operating sluice box. Note clearing operations in background. CENTER—Joe on his way down. "Smooch" operating the air hoist. LOWER—Bill handling the bucket line.

Loose Gravel Problem

We anticipated sinking holes to a depth of approximately 25 feet through loose boulderous gravel. This would put us at least 20 feet below the surface of the river. Our two main problems to overcome were loose gravel and an excessive amount of water. To combat the loose gravel and prevent a cave-in, we used a set of caissons. These were cylindrical 4-foot sections of ¼-inch steel with graduated diameters, the largest being 42 inches. They decreased in diameter approximately two inches per section to nest inside the largest one.

After digging the initial four feet the largest caisson was placed and securely anchored to a platform built of 2 x 12's. The second caisson was then placed inside the first and as we dug, working inside the caisson, we worked the second caisson down until it rested on the inside bottom lip of the first. Then the third was inserted and so on.

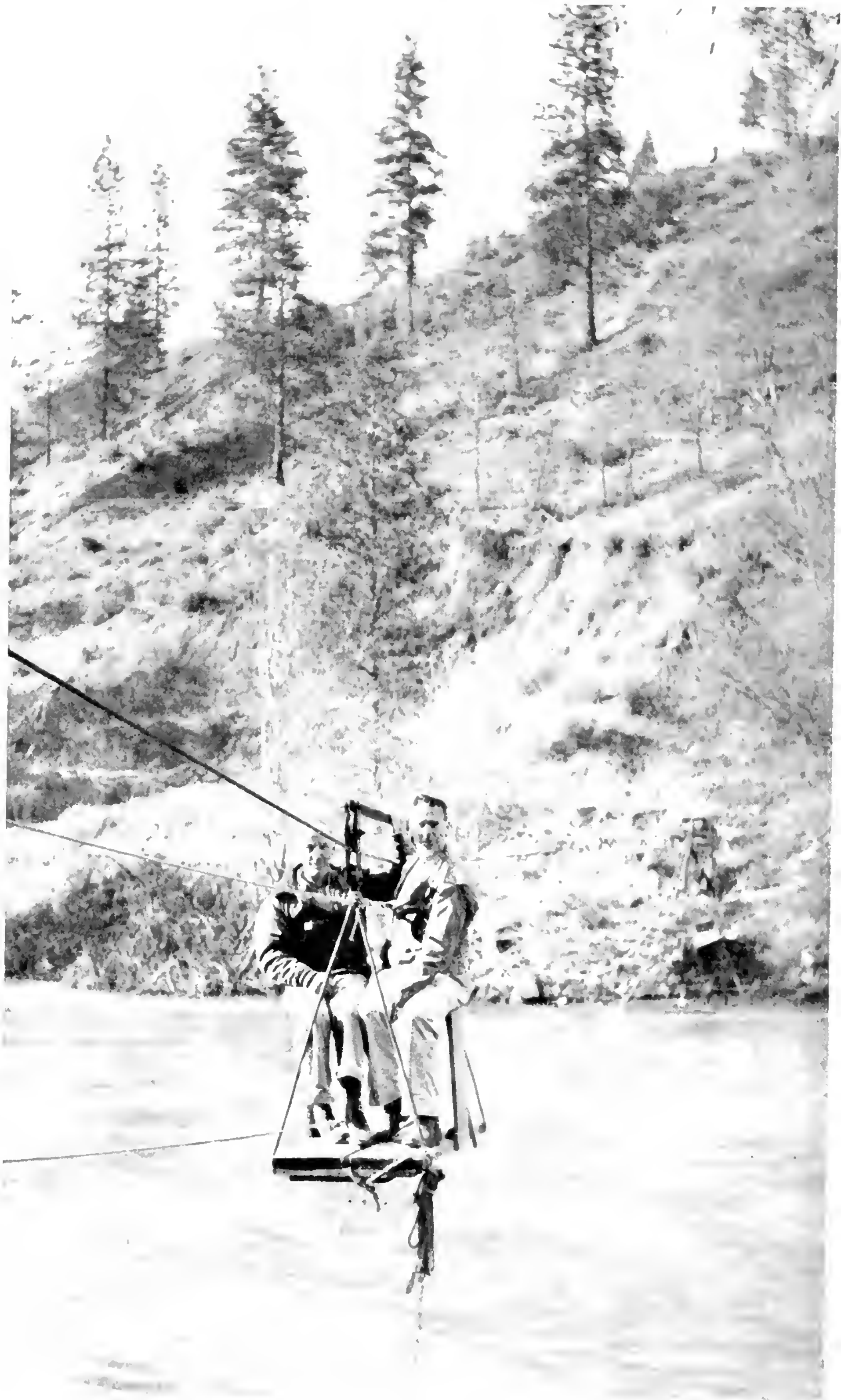
Mining Operations

For the most part, the digging operation was done by Joe, the air hoist was operated by Smooch, Jim did the sluicing and panning, and I handled the muck from the hole to the sluice box.

The working equipment used inside the caissons, besides Joe (who incidentally, is no small item), consisted of a short-handled pick, shovel and sledge hammer, five gallon bucket, an intake hose from the three-inch suction pump, and the air-driven pump with its air hose, discharge hose, and one-inch exhaust pipe which extended above the top of the hole to carry off the fumes. The base of this pump had to be submerged for the pump to function properly. If you can picture Joe and all this gear working inside a 32-inch diameter pipe extracting material which contained boulders up to 15 inches in diameter, you'll have a rough idea of the laborious task that confronted us.

Weather Not So Good

As for the weather during our operations, it wasn't that the cold bothered us so much, it was just that it became quite annoying to have to keep breaking chunks of our breath off as it became solidified in front of our faces! We dug out from under a four-inch snowfall one morning before starting work.



Engineer Erich and Attorney John Horgan riding the commuters' special

Just before we finished the job the contractor caught up with us with his clearing operations and we spent a good part of one day dodging falling timber and over-enthusiastic "cat-skinners."

All in all, we sank three shafts, the depths being 20, 12 and 6 feet. The 12-foot hole was 150 feet from the river and all the gravel had to be wheelbarrowed that distance to the sluicing and panning operation. We dug to bedrock in the first two holes. However, storms brought the river level up and forced us to abandon the 6-foot hole before reaching bedrock. In addition to these shafts, we re-opened and investigated several old sidehill tunnel workings.

Summory of Job

The following is a summation of the job and what was accomplished by it.

Our phase of the project took 19 working days, exclusive of preparatory work. We handled approximately 20 cubic yards of material, from the three shafts, through the sluice box and from 20 to 25 cubic yards in our sidehill tunnel investigations. The total amount of gold recovered by our operations was $4.86. From this our mining engineer assayed the over-all gold bearing value of the property at 14 cents per cubic yard. The cost of recovering this gold by the most feasible methods at the time of our investigations was estimated at between 35 cents and 50 cents per cubic yard. As can readily be seen by these figures, we conclusively proved that gold mining operations could not be carried on profitably; therefore, the gold bearing potential of the property had no value.

The Right of Way Department had originally appraised the property (14.4 acres) at $564. Based on the property owner's gold evaluation estimates, our mining engineer, Mr. Erick, foresaw a claim possibly in excess of $100,000.

After all the facts were in, the final settlement was made for $1,600. The increase over the original appraisal was due to the cabin site value of the land claimed by the owner.

The total cost of our evaluation project was approximately $4,000.

UPPER—Operations in full swing. Left to right, Jim, Joe, Bill, and "Smooch." LOWER—Jim and the caissons.

These figures reflect a saving to the State of from $96,000 to possibly more than $100,000.

Our arduous back-aching chore apparently paid off, although those of us who performed the job still shudder every time we are out contacting property owners on material investigations and the word *gold* is mentioned.

TREE CREW EFFICIENT

WESTERN ENGINEERING

Mr. S. Evans
Division of Highways

Dear Mr. Evans: We wish to thank you for the clean, careful, fast, conscientious job done by your tree crew in the trimming of the trees at Thornton and Walnut Streets, this town, thereby getting rid of the danger to the children of the neighborhood and to our property.

Carl Stell

THE STATE OF WISCONSIN
Highway Commission

Mr. Kenneth C. Adams, *Editor*

Dear Sir: We read your magazine with interest and find many of the articles and particularly the illustrations of great interest and real value. We hope that you may be able to continue to keep us on your mailing list because we do not wish to miss any of the issues of the magazine.

Wayne N. Volk
Engineer of Traffic Services

Retirements *from* Service

Stewart Mitchell

Stewart Mitchell, principal bridge engineer, retired from the Bridge Department, Division of Highways, on March 31, 1955, after 31 years' service.

Stewart was born in Belfast, Ireland, on March 24, 1885, and came to the United States when he was four years old. He lived first in Wisconsin, where his father taught at St. John's Military Academy, and later in Indianapolis, Indiana, where he attended school. He graduated from Purdue University in 1908 with a B.S. degree in civil engineering.

STEWART MITCHELL

During the next nine years he worked successively for the Union Pacific Railroad in Denver, the Southern Alberta Land Company in Canada and the United States Interstate Commerce Commission in Chattanooga,

. . . Continued on page 49

Arthur S. M. Payne

Arthur Stephen Morley Payne, construction supervisor II, with the Division of Architecture, was honored by more than a hundred friends and associates on the occasion of his retirement by a dinner held at Walker's Restaurant in Napa on January 22d.

Born January 5, 1885, in London, England, Payne, as a young man, was apprenticed as a carpenter, receiving his journeyman's papers, and shortly thereafter setting out to see the world. He landed in Halifax, Nova Scotia in 1904 and worked his way across Canada, arriving in Vancouver, B. C., in 1911. There he worked as a carpenter for four years until he went to San Francisco in 1916, where he held jobs as foreman and superintendent.

After two years in Mexico coal mining, he returned to San Francisco and went into the contracting business for himself in 1922. From that year until 1939 he contracted, building homes and undertaking residential development.

In 1939 he became co-owner of a whaling ship and spent a year whale hunting, but returned to San Francisco again and resumed contracting. During this period he built the million dollar service club at Fort Ord.

With the advent of World War II, Payne, who had seven brothers in the British armed forces, went into war work.

He worked for the Engineering Section of Western Pipe and Steel Shipyards and the Ships' Design Section of Barrett & Hilp Construction Company. In 1945 he became outside superintendent for the Pacific Construction Company.

Payne's service with the Division of Architecture began on August 1, 1948, as associate construction supervisor.

. . . Continued on page 49

Fred B. Dauchy

Fred B. Dauchy, assistant highway engineer in District VIII, retired February 1, 1955, after a long career in all phases of highway work.

Fred was born in Topeka, Kansas, and at an early age moved to the Panama Canal Zone. His father, Walter E. Dauchy, became division engineer in charge of the Culebra Cut of the Panama Canal in October, 1904, and later was made acting chief engineer during the absence of Chief Engineer John Wallace. The family returned to the United States and settled in Riverside, where Fred graduated from Riverside High School. His first engineering position was as a rodman and chainman for the Riverside County Highway Commission. Before coming to work for District VIII, he was also employed by the City of Riverside, several consulting engineers, Los Angeles County Flood Control District, City of Willows, and the Southern California Edison Company.

FRED B. DAUCHY

First employed by the State as a draftsman on October 23, 1925, he soon became one of the most valuable men in District VIII, filling various assignments in the drafting room, on construction, and on surveys. His specialty in later years was in right of way calculations, and he was frequently called upon to take charge of special surveys that had run into unusual complications.

Fred will continue to commute from his home in Riverside, just as he has all the years he worked in District VIII, as he plans to establish himself with a firm of civil engineers in San Bernardino, specializing in subdivision work.

STEWART MITCHELL

Continued from page 48 . . .

Tennessee. In 1916 he married Florence Kidd of Roseburg, Oregon.

During World War I he served as a captain with the 306th Engineers and spent a year overseas, taking part in the Meuse-Argonne offensive. He was one of the delegates chosen to represent the 81st Division in Paris in 1919, at the initial meeting at which the American Legion was created and organized.

After leaving military service he went to work as a resident engineer for the Oregon State Highway Department. Subsequently he came to California to accept a position with the Division of Highways in 1924; first serving as resident engineer on the Klamath River Bridge in Del Norte County.

In 1927 he came to Headquarters Office in Sacramento where he served continuously until his retirement, first as bridge maintenance engineer, then successively as bridge construction engineer, engineer in charge of bridge planning and design and engineer in charge of special investigations.

Mitchell is a past president of the Sacramento Section of the American Society of Civil Engineers and past national chairman of the Structural Division of the Society's Executive Committee. He is also a member of the American Concrete Institute, International Association for Bridge and Structural Engineers, and the honorary engineering fraternity, Tau Beta Pi.

His hobbies are golf, photography and early California history. Perhaps his chief hobby is California history. He is one of the recognized authorities on California immigrant trails and has published several authoritative articles on this subject. He did research work and wrote the topographic section of the recently published book, "Alonzo Delano's California Correspondence." He is a member of the California Historical Society and the Sacramento Book Collectors Club and a charter member of the Sacramento County Historical Society. With his many hobbies and interests, Stewart says he will have no trouble keeping busy after leaving state service.

Mr. Mitchell and his wife reside at 2625 Rochon Way, Sacramento. They have two sons, Stewart, Jr., also with the Division of Highways, and Robert K., an engineer residing in the San Francisco Bay area, and two grandchildren, Douglass Earl, 3, and Gordon Stewart, 1. His co-workers honored him with a luncheon on the day of his retiremenr.

Mr. Mitchell's flair for research, his vast specialized knowledge and his ability to analyze difficult problems have set him apart as an authority on many of the special problems which have developed during the years. He has been directly responsible for the preparation of numerous special reports, such as the acquisition of existing toll bridges, the justification and feasibility of proposed toll bridges and tunnels, and more recently, studies in connection with mass rapid transit.

SWEETWATER ROAD

Continued from page 41 . . .

Heavy Grading

The shaping and compaction were managed with the usual equipment and presented no difficulties. The final grading, however, was considerably hampered by the large number of oversize rocks near the surface. It was often necessary to re-rip the roadbed several times to remove them and then to haul in more material to bring the road back to grade.

Grading involved 175,000 cubic yards of roadway excavation and 41,000 cubic yards for construction of channel changes. Overhaul of 1,700,000 station yards was necessary and 22,700 tons of base were laid.

Generally the grading presented no major problems. The drainage was quite a different matter. Springs and subsurface water necessitated 676 linear feet of eight-inch perforated metal pipe to free the area of superfluous water. Several previously unsuspected springs were encountered. The worst of these appeared in the semicompleted fill over the old river bed at one of the channel changes. This area was excavated to the old ground level and an underdrain composed of volcanic cinder filter material and perforated metal pipe was installed. Over this several layers of asphalt roofing paper were placed as an impervious membrane. At several other locations the drainage pattern was unusual because of the subsurface water and the tight clayey nature of the basement soil.

The channel changes were excavated with dozers, scrapers and a 1½ cubic yard dragline. They caused considerable trouble because of the disadvantage of working the equipment in water a good deal of the time. The dragline couldn't handle a good portion of the cemented rocky material and dozers were called in to loosen this area. Slope protection of 5,000 cubic yards selected rock was placed to shield the road from the rampages of the river.

The project as a whole ran smoothly with few major delays. Although the Fallon, Nevada, earthquake rolled rocks down the hills and threatened to rock the house trailers off their foundations, no damage was done.

W. R. Coons was the resident engineer under the direction of J. R. Jarvis, District IX Construction Engineer, and the writer of this article was assistant resident engineer.

ARTHUR S. M. PAYNE

Continued from page 48 . . .

He became a senior construction supervisor in November of that year and on March 24, 1952, was appointed construction supervisor in charge of the Arcata-Eureka Subdistrict. During his years of state service, it is estimated that Payne was in charge of $10,600,000 worth of construction work.

STEEL AND CONCRETE

Contract plans, specifications and estimates were prepared for building, widening or repairing 377 state highway structures during the 1953-54 Fiscal Year. Materials required in the construction of these bridges include approximately 44,000,000 pounds of structural steel, 79,000,000 pounds of reinforcing steel and 460,000 cubic yards of concrete.

New Luminaire

Fluorescent Street Light For Wet Pavements Designed

By G. M. WEBB, Traffic Engineer, and
ROY W. MATTHEWS, Assistant Traffic Engineer

IN THE USUAL practice of highway illumination, considerable dependence is placed on being able to observe obstructions on the traveled way by silhouette against light reflected from the pavement. Ordinarily, this illumination is provided by point sources of light, such as mercury vapor and incandescent lamps; however, illumination in this manner is not satisfactory when the pavement becomes wet. Each point source creates a narrow streak of light on the wet pavement between the source and the observer and leaves adjacent areas of pavement on either side of the streak in comparative darkness.

Throughout the greater portion of Southern and Central California, wet pavements do not pose much of a problem. However, the coastal area of California between the Pacific Ocean and the Coast Range, and extending for a distance of 150 miles south from the Oregon border, has a mean annual precipitation of from 3 to over 6 *feet*, and 120 rainy days each year. This means that highway pavements are wet on the average of one night in three throughout the year.

New Luminaire

In an attempt to improve the effectiveness of the lighting on these continually wet pavements, electrical engineers in the Traffic Department designed a new fluorescent luminaire. The design was based on the following considerations:

(1) As broad a band of light as practicable should be placed across the road to provide illumination for silhouetting against the wet pavement.

(2) Pavement brightness should be kept near a minimum of one foot-candle and relatively uniform as far as possible in both directions from the source of light, in order to minimize glare contrast since the background is generally completely dark at these isolated intersections.

(3) High-angle glare above 76 degrees should be minimized.

(4) Fixture design should be kept simple in order to reduce first costs.

(5) Power consumption and maintenance costs should be kept as low as practicable.

Experiments

A previously designed eight-foot fluorescent luminaire has provided a number of clues that have contributed

New-type fluorescent luminaires, specially designed for the moist north coastal climate, in place at an intersection on US 101 in Arcata, Humboldt County

Night view on US 101 in Arcata during wet weather, showing broad band of light across intersection and its approaches provided by the new-type luminaire

considerably to the new design. After studying this luminaire, we concluded that with more than one lamp inside a reflector we lost too much control of the emitted light, and as a consequence, wasted light that should be placed out on the aavement. We then proceeded to see how much light from a single lamp we could effectively place on the pavement.

A parabolic reflector was placed behind an eight-foot T12 5,800-lumen lamp and directed at an angle of 70 degrees with the vertical in order to reflect as much light in that direction as possible. A flat surface was then placed above the lamp inclined at the 70-degree angle and about 2½ inches from the center of the lamp. This surface extended out far enough to cut off incident high-angle light. Its extent was limited by the need to keep the fixture from becoming too cumbersome, and a compromise was selected that permitted about 1½ percent of the incident light to show above 76 degrees. This was not considered to be enough to cause objectionable glare. The flat reflector redirected all that light between 80 degrees and that redirected by the parabola, onto the pavement. This light reinforced the direct light from the lamp, which also lighted that area.

Model Tested

A model consisting of two separate lamp and reflector units placed back-to-back and lined with aluminum foil, was tested and gave the pattern shown, which is a great improvement over the original design. Some of the dimensions were adjusted and we were able to place somewhat over one foot-candle on the pavement for 45 degrees out in each direction from the fixture. The flat surface was subsequently curved in order to give a more pleasing appearance and yet not interfere significantly with its primary reflective properties. Tests on a model having a white reflecting surface of better than 80 percent reflection factor, made it obvious to us that specularity, rather than reflectance factor, was the important characteristic of the reflecting surface.

Fixture Not Enclosed

It was not considered practicable to enclose the fixture, for two reasons. It would be impossible to keep the fixture from breathing, due to temperature changes, which would introduce dust onto the inner face of the cover. It was also considered impractical to shape the cover in a manner that would not disturb the light pattern because of refractive properties of the transparent cover.

Since these luminaires are designed primarily for coastal areas, we are considerably concerned as to the corrosive effect of the salt atmosphere upon the reflector aluminum surface. It has been the experience on the San Francisco-Oakland Bay Bridge that exposed reflectors deteriorate quite rapidly. However, the reflectors have been maintained in satisfactory condition for a period of about two years by refinishing and recoating the specular surface with methacrylate resin lacquer. We expect that the maintenance personnel will have to change tubes and refinish reflectors about every two years. To simplify their job on the end of a 30-foot ladder, we have designed the inner reflectors in two four-foot lengths—completely interchangeable units for each lamp. It has been necessary to design a special

. . . *Continued on page 64*

THE TWIN DRAGONS OF THE SESPE

By HUGH WHITNALL, Associate Highway Engineer

State Sign Route 126 is the only traffic artery serving the entire length of the rich Santa Clara River Valley of Ventura County. One of the most important sections of this state highway is that portion which joins the two principal cities of the valley, Santa Paula and Fillmore. The connecting link between these two cities crosses Sespe Creek. Now this creek, like so many Southern California creeks, is dry a good part of the year. Even in the normal winter months the water flows quietly without destructive force. However, in flood years this creek has a history of violent destruction. It does not merely rise slowly and inundate bordering lands but, rather like a frenzied dragon, it growls and thrashes about, making the whole valley resound with the rumble of rolling and crashing rocks many the size of an automobile!

To effect a safe and economical crossing of this aqueous dragon, both the state highway and the paralleling Southern Pacific Railroad a generation or more ago made a loop up into the draw of Sespe Creek where it enters Santa Clara Valley. This loop adds a length of about one mile to the shortest possible alignment across the creek, but it does afford a relatively narrow crossing. However, the Sespe dragon has more than once come growling and thrashing out of the mountains and reduced both highway and railroad bridges to masses of shattered wood and steel.

Shorter Route Needed

As the Santa Clara Valley grew in importance primarily through the expansion of the citrus and the oil industries, the need became acute to eliminate for the benefit of through traffic the one mile of circuitous travel from the existing Sespe Creek crossing with its old narrow steel bridge. So, some 20 years ago the State instituted studies and drew up plans for a new crossing of the Sespe some distance downstream on direct alignment. This new crossing was to follow essentially the same alignment as that of the just completed project. This former plan provided for the highway to cross the creek on a single bridge 700 feet long spanning the main channel. Plans and right of way acquisition on this basis were being completed at the end of 1937.

Then one night in March of 1938 the dragon of the Sespe again came growling out of the mountains. It not only thrashed its tail around, causing the destruction of everything in its path, but this time its thrashing and writhing were so violent that the dragon exploded into twin dragons each as large as the former water torrent! Not only were all bridges in its path wrecked by one of the dragons but now the twin cut a parallel path of ruin through road, railroad, and farms. The former state highway plan of 1937 was shown to be obviously inadequate, for now it would take two 700-foot bridges spaced about one-third of a mile apart to leap the Sespe.

The proposed project for the new crossing had to be temporarily abandoned and a new engineering study initiated. World War II came along before the new engineering study was completed and before construction funds could be made available by the California Highway Commission.

Unique Problem

After the war, the project was started again. It was now realized that this project did not revolve around questions of ordinary highway design. This project called for developing some means of holding the twin dragon in place long enough and securely enough to warrant the expense of constructing two 700-foot bridges to carry the state highway across the double river. This challenging problem was assigned to L. M. Wade of the District VII Design Staff under the general direction of L. S. VanVoorhis. Under the able supervision of these engineers, the design to tame the twin dragon was developed. The final plan called for three major construction items:

1. Two miles of heavy section river-bank levees faced with heavy rock riprap to repress and guide the wild maneuverings of the twin dragon.
2. Two 700-foot two-lane bridges to vault across the dragon.
3. Two and one-third miles of state highway on new alignment.

It is evident that the road work was actually a minor portion of the contemplated contract. However, since the value of the river-bank levees plus the road work was somewhat more than one-half of the total estimated cost of the contract, the construction work was carried out under the supervision of district engineering forces. To supervise the construction of the two bridges the Bridge Department assigned one of its most able resident engineers, Donald W. Alden, as the Bridge Department Representative. The two bridges were of reinforced concrete girder design on concrete piers and steel "H" piles. The building of these two structures entailed the use of standard materials and methods, and bridge construction proceeded according to schedule with nothing unusual to report.

"Appian Way" Type Pavement

However, the building of both the river-bank levees and the highway involved unusual construction problems. In the case of the levees, the one item alone of heavy stone riprap was bid in by the contractor at a price $90,000 less than that of the second highest bidder! The subcontractor on this item of work, C. B. Clarkson, was able to make a profitable operation on the low bid by obtaining his rock as a by-product of an extensive land clearing operation on the nearby Ranch Sespe rather than obtaining rock from a commercial quarry in the usual manner. In the case of the highway construction, the contract called for three inches of

UPPER—New Sespe Creek Bridge. LOWER—Ribbon-cutting ceremony. Left to right: Paul O. Harding, Assistant State Highway Engineer; Fergus Fairbanks and C. A. Maghetti, Secretary, California Highway Commission.

plant-mixed surfacing to be laid on a 21-inch base of selected material. The contractor constructed the bottom 15 inches of the base with material consisting largely of boulders, and then topped the boulders with a 6-inch blanket of gravel. The problem of making this "Appian Way" type of pavement with a heavy rock course topped by smaller rock was possibly unique in California road making experience. The many perplexing construction problems involved were solved efficiently by the contractor. The district staff will watch with interest over the years the stability of this Roman type road under heavy high-speed modern traffic.

City Cooperation

Another matter which was unique on this contract, at least in the 18 years of experience of this writer, was the high degree of foresight, initiative, and cooperation extended to the State's representatives by the City of Fillmore through its city manager, C. Leon Harthorn. Through Mr. Harthorn's efforts extensive work on water and sewer lines originally scheduled to be done after the road was opened to traffic was done instead during construction on an emergency basis by the city so that the public would not have to endure the sight of new pavement being immediately torn up for utility line installations.

The opening of this new crossing of Sespe Creek to traffic was celebrated February 8, 1955, by an appropriate ribbon-cutting ceremony and banquet, under the joint auspices of

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California Bridges

Construction Costs Moved Downward During 1954

By J. S. McCLELLAND, Assistant Statistician, and
W. J. YUSAVAGE, Assistant Research Technician, Bridge Department

A NEW DECLINE in bid prices during 1954 carried California bridge construction costs to the lowest levels of the past four years. The moderate upswing of prices during 1953 ended with the first quarter of 1954 as costs declined 6 percent from the level of the preceding quarter. Midyear prices fluctuated mildly then, during the fourth quarter, prices declined further to a point 9 percent below the level of one year earlier.

A general downtrend of costs originated late in 1951. Since that time, costs have followed this downward course with only brief interruptions by periods of fluctuation and reversal. As of the fourth quarter of 1954 costs have declined approximately 17 percent from the 1951 high and are slightly lower than the level encountered during the 1946-1948 period. The level of costs for each quarter of 1954 can be found in the accompanying chart which indicates the course of California bridge construction costs since 1933.

Computation of Costs

Bridge construction costs are based upon successful bidders' unit prices for 14 contract items of work in bridge construction. These items, which are listed in *Table I*, represent approximately 80 percent of the contract cost to the State for bridge construction. The remaining 20 percent is comprised mainly of work items for which lump sum bids are commonly requested and which are not suitable for periods for periodic comparison. The cost of a schedule of work, also shown in *Table I*, employing the average successful bid unit prices for the period, provides the basis for comparison of periodic costs. The period 1939-1940 provides the base level of costs with which the levels for all other periods are compared and also provides the item quantities of the fixed schedule.

This article is the third in a series dealing with California bridge construction costs. Previous articles appeared in the January-February, 1953, and January-February, 1954, issues.

For total California highway construction costs the reader is referred to a series of articles entitled "Cost Index," by R. H. Wilson, H. C. McCarty, and J. D. Gallagher, the most recent of which appeared in the January-February, 1955, issue of *California Highways and Public Works*.

Volume of Bridge Construction

Contract expenditures by the State for bridge construction are also shown, in index form, in the accompanying chart. Yearly levels of expenditure are shown in one index and expenditures, adjusted to compensate for changes in the level of costs, are shown in the other index. The latter serves an an approximation of the physical volume of work accomplished with the given expenditure.

These indexes show the marked increase in bridge construction which has accompanied the augmentation of state highway budgets during recent years. As a result of legislation which substantially increased highway-user tax revenues during 1953 and also as a result of the continued development of full freeways with their requisite separation structures, expenditures during the past year for bridge construction rose to nearly 45 million dollars or approximately 900 percent of the average annual rate of expenditure during the base period 1939-1940.

Table II lists the index values of the three indexes for periods subsequent to 1933 and the total value of low bids, in millions of dollars, for proposed bridge construction

TABLE I

TOTAL QUANTITIES, WEIGHTED AVERAGE PRICES, AND DOLLAR AND RELATIVE VALUES OF LOW BIDS FOR 14 PRINCIPAL ITEMS OF WORK IN CALIFORNIA BRIDGE CONSTRUCTION

CALENDAR YEARS 1939 AND 1940

Items of work	Total base period contract quantities	Weighted average prices	Dollar values of base period low bids	Relative values
Structure excavation	156,286 cubic yards	$1.56	$244,398.00	3.24%
Class "A" portland cement concrete (structure)	176,634 cubic yards	18.42	3,252,837.00	43.13
Class "A" portland cement concrete (footing block)	12,774 cubic yards	12.04	153,745.00	2.04
Structural steel (plate girder)	5,810,000 pounds	.077	450,221.00	5.97
Structural steel (rolled beam)	4,953,000 pounds	.063	310,900.00	4.12
Structural steel (truss)	7,884,000 pounds	.099	782,269.00	10.37
Miscellaneous iron and steel	766,630 pounds	.138	105,639.00	1.40
Bar reinforcing steel	35,958,000 pounds	.040	1,440,424.00	19.10
Furnishing steel piling	79,329 linear feet	1.79	142,168.00	1.88
Furnishing concrete piling	146,861 linear feet	1.60	235,477.00	3.12
Driving steel piling	2,313 each	25.29	58,490.00	.78
Driving concrete piling	3,781 each	40.84	154,411.00	2.05
Steel bridge railing	21,709 linear feet	5.93	128,798.00	1.71
Concrete bridge railing	42,976 linear feet	1.91	82,190.00	1.09
			$7,541,967.00	100.00%

on which bids were received during the respective periods.

General Trends

Average unit prices for the various items of work, as compiled for each quarter, show considerable variation in trend during the past few years. Bid prices for concrete (structure) rose to their highest level during 1953 but declined approximately 10 percent during 1954. Reinforcing steel has remained virtually unchanged in price during the past three years while structural steel, although subject to fluctuations in price, has declined approximately 20 percent during the same period. Relating the price levels for various items during the fourth quarter of 1954 to the respective item base period prices (shown in Table I), concrete (structure) stands at approximately 250 percent, reinforcing steel and the three items of structural steel at 230 percent and 180 percent, respectively, while the contract item structure excavation, which has undergone the least increase from the base price level, stands at 125 percent.

The decline of costs during the past year has been accompanied by further extensions of competition in bidding. During 1954 the average number of bids received on projects involving structures was approximately 10 percent higher than for the previous year, exceeded the average for the year 1952 by 50 percent, and was approximately double the average for 1951. The nature of competition is indicated most graphically, however, by the further declines in bid prices in view of the continued increases in wage rates and materials prices.

Outlook

The present downtrend of construction costs made its appearance as the dislocations accompanying the early months of the Korean War began to ease. The prospects of more efficient operation improved as materials and experienced labor became more readily available; and, with the pressure of stiffening competition, bid prices began to fall. The decline halted during 1953 and, for the time, it appeared that the trend of construction costs had started upward in response to the rising cost of labor and materials. The upward movement was halted during the past year, however, as strong competition brought about substantial reductions in bid prices.

TABLE II

INDEXES RELATING TO CALIFORNIA BRIDGE CONSTRUCTION AND PERIODIC DOLLAR VALUES OF LOW BIDS ON CALIFORNIA BRIDGE CONSTRUCTION

I Year	II Quarter	III Index of the cost of California bridge construction (1939-1940—100)	IV Index of the value of California bridge construction (1939-1940—100)		V Index of the volume of California bridge construction (1939-1940—100)		VI Dollar value of low bids on California bridge construction (in millions of dollars)	
1934		94	60*		64*		3.1	
1935		88	138*		157*		7.1	
1936		98	72*		73*		3.7	
1937		114	60*		53*		3.1	
1938		99	78*		79*		4.0	
1939		101	99*		98*		5.1	
1940		99	101*		102*		5.2	
1941		122	78*		64*		4.0	
1942		158	80*		50*		4.1	
1943		165	16*		9*		.8	
1944		153	29*		19*		1.5	
1945		167	109*		65*		5.6	
1946	1st	156	247*	342	133*	219	12.7	4.4
1946	2d	190		295		155		3.8
1946	3d	224		148		66		1.9
1946	4th	217		202		93		2.6
1947	1st	224	443*	280	202*	125	22.8	3.6
1947	2d	216		629		291		8.1
1947	3d	219		450		206		5.8
1947	4th	223		412		185		5.3
1948	1st	220	307*	233	134*	106	15.8	3.0
1948	2d	225		365		162		4.7
1948	3d	238		381		160		4.9
1948	4th	231		249		108		3.2
1949	1st	207	233*	186	117*	90	12.0	2.4
1949	2d	210		342		163		4.4
1949	3d	191		194		102		2.5
1949	4th	187		210		112		2.7
1950	1st	177	262*	124	129*	70	13.5	1.6
1950	2d	195		357		183		4.6
1950	3d	212		171		81		2.2
1950	4th	218		396		182		5.1
1951	1st	243	617*	528	247*	217	31.8	6.8
1951	2d	250		948		379		12.2
1951	3d	256		598		234		7.7
1951	4th	253		396		157		5.1
1952	1st	239	561*	396	237*	166	28.9	5.1
1952	2d	236		1,017		431		13.1
1952	3d	239		652		273		8.4
1952	4th	223		179		80		2.3
1953	1st	243	522*	140	227*	58	26.9	1.8
1953	2d	224		707		315		9.1
1953	3d	231		893		387		11.5
1953	4th	235		350		149		4.5
1954	1st	221	870*	691	399*	313	44.8	8.9
1954	2d	217		1,196		551		15.4
1954	3d	220		1,002		455		12.9
1954	4th	213		590		277		7.6

* Average quarterly information.

Estimates prepared jointly by the U. S. Departments of Commerce and Labor foresee a record volume of construction activity for the coming

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POLICY OF CALIFORNIA HIGHWAY COMMISSION IN REGARD TO THE ADOPTION OF FREEWAY ROUTES

An expanded restatement of the policy of the California Highway Commission in regard to the procedure leading up to freeway route determinations has been issued to each city council and county board of supervisors throughout the State.

In a letter transmitting the text of a commission resolution covering the statement of policy, Commission Secretary C. A. Maghetti explained to the cities and counties that the purpose of the resolution is to "assure a fuller understanding of the freeway needs and proposals in affected communities."

Maghetti said there is no actual change in procedure involved, but that the applicable laws are cited and the preliminary steps which are taken by the Division of Highways in arriving at route recommendations for commission consideration are now spelled out in official policy.

The text of the commission resolution follows:

Whereas, In view of the continuation of present highway user taxes at the level established in 1953, the augmentation of the highway program resulting therefrom, and the state-wide interest in freeways and freeway locations, the California Highway Commission desires to restate and redefine its policy and procedure with reference to the adoption of the location or relocation of any state highway which is to be constructed as a freeway on substantially new alignment; and

Whereas, Section 71 of the Streets and Highways Code provides that "The commission may alter or change the location of any state highway if in the opinion of the commission such alteration or change is for the best interest of the State."; and

Whereas, Section 75 of said code provides, in part, that "Except as otherwise provided by law, the commission at any time and from time to time may: (a) Select, adopt, and determine the location for state highways on routes authorized by law."; and

Whereas, Section 111 of said code provides, in part, that "Whenever the natural course of a state highway passes into or through any city and a state highway route through or around such city is not specifically described by law, the commission shall determine the location of the connecting portion necessary to make the state highway continuous. Such location may be either through or around such city, depending upon the commission's determination as to which location will be of the greatest benefit to through traffic upon such state highway."; and

Whereas, Section 100.3 of said code provides, in part, that "From and after the adoption of a resolution by the California Highway Commission declaring any section of state highway to be a freeway, the highway described in such resolution shall have the status of a freeway * * *," subject to acquisition of affected private property or private property rights; and

Whereas, In order that the commission may act in the best interest of the State in the selection and adoption of locations for state highways, or sections thereof, being considered for adoption and construction as freeways, it is required by the commission that it have before it all pertinent data relative thereto, including engineering and economic analyses respecting particular proposals; now, therefore be it

Resolved by the California Highway Commission, That the following procedure is hereby established for determination of the location or relocation of any state highway, or portion thereof, which is proposed to be constructed as a freeway on a location not then in use as a traversable state highway:

1. That, when sufficient engineering and economic data have been accumulated to support a tentative conclusion as to a basic plan for the location or relocation of any highway proposed to be constructed as a freeway, the State Highway Engineer, or his authorized representative or representatives, will confer with the appropriate city council or board of supervisors, or both such council and board, and with their technical staffs, including planning commissions and staffs, and will publicize and hold such meetings as may be reasonably necessary to acquaint interested individuals, officials and civic or other groups with the information developed.

2. After such conferences and meetings, the State Highway Engineer will submit a report to the commission covering the results of such conferences and meetings, the studies made, and a recommendation as to the location or relocation of the highway, or section of highway, proposed to be constructed as a freeway which in his judgment, subject to all laws applicable thereto, will serve the best interests of the State.

3. The State Highway Engineer, on authorization of the commission, will give public notice of the commission's intention to consider the adoption of the location or relocation of the highway, or section of highway, in question and will also give written notice to the city council or board of supervisors, or both, as the case may be, of such intention. Unless the local legislative body or bodies by resolution have previously declared that no public hearing by the commission is necessary or desirable, such notice to the local legislative body or bodies shall specify that if any such legislative body considers a public hearing on the matter necessary, the commission will hold, or cause to be held, such hearing, if so requested by any such local legislative body within thirty (30) days after the first regular meeting of such body following receipt of such written notice.

4. If any such legislative body requests such hearing, the commission, or designated members thereof, will hold, or cause to be held, a hearing, after due public notice of the time and place thereof, at which time and place all persons and organizations, and official bodies interested in the matter will be given opportunity to be heard.

5. The commission may, on its own motion, call a public meeting or hold such hearings, or rehearings, as it may deem appropriate.

6. After the expiration of such period of thirty (30) days, if no hearing is requested, or after such hearing, or after such hearing as the commission may hold on its own initiative, the commission will take action in respect to the location or relocation of such highway proposed to be constructed as a freeway.

7. The authorization referred to in numbered paragraph 3 of this resolution, to give public notice of the commission's intention to hold a hearing, shall be by resolution of the commission relating to each specific location or relocation of the highway proposed to be considered. In all other respects, this resolution authorizes the State Highway Engineer, without further resolution or order of this commission, to do such things and take such action as may appear to him to be necessary or proper to comply with the above specified procedure and to comply with the herein announced purpose of the commission to inform the interested individuals and officials as to the nature of and the reasons for the particular proposal.

8. The resolutions of the commission regarding the subject matter hereof, adopted on July 15, 1948, and on July 23, 1953, are hereby rescinded.

SOUTHERN CROSSING PLANS MEET APPROVAL

Southern Crossing consultants meet. Standing: Director of Public Works Frank B. Durkee and Norman C. Raab, Projects Engineer. Seated, left to right: O. J. Porter, Ralph Smillie, and Charles E. Andrew.

PLANS FOR a southern crossing of San Francisco Bay as prepared thus far by Norman C. Raab, Chief, Division of Bay Toll Crossings, have been approved by a board of engineering consultants engaged by the California Toll Bridge Authority.

The consultants, Ralph Smillie of New York, O. J. Porter of Newark, New Jersey, and Charles E. Andrew of Tacoma, Washington—all nationally outstanding engineers—met with Raab and his engineering staff, and with Director of Public Works Frank B. Durkee in San Francisco on February 21st, 22d, and 23d in the first of three planned conferences.

Porter is an authority on bridge foundations, Smillie on underwater tubes, and Andrew on general toll bridge construction.

After three days spent in reviewing the work accomplished by Raab and his aides thus far and in an inspection tour of the proposed anchorages and approach routes on both sides of the bay, it was agreed by the consultants that the project is engineeringly feasible, that the plans are in agreement with the mandate of the statute, and that the work is progressing satisfactorily and as rapidly as can be expected.

Raab estimates that construction of the proposed crossing can begin by the middle of 1956.

The consultants will meet with state engineers again during the progress of the studies, and a third conference will be held late this year, probably in December, when the preliminary plans are expected to be completed and cost estimates computed.

TOLERANCE

Experienced drivers should show tolerance for the faults and errors of those who are obviously beginners. Impatience or wild use of the horn in such cases is likely to confuse the unskilled driver and may make a bad situation worse.

Quarter Century Club Announces Officers for 1955

The Quarter Century Club, an organization of Division of Highways employees who have served more than 25 years, recently announced the results of its annual election. Officers for the year 1955 are: President, F. W. Montell, District IV; First Vice President, E. J. Gribble, District II; Second Vice President, R. B. Luckenbach, District XI; Secretary-Treasurer, B. Van Dalsem, District IV, and Historian, E. E. Sorenson, Headquarters, Equipment Department.

The Quarter Century Club was organized in 1939 by a group of 23 charter members who believed that the older employees should maintain an organization which would serve as an identification of longevity in faithful service to the Highway Department and would also serve as a means of communication between "old timers."

Many members of the club took an active part in the events which lead to enactment of legislation which now permits the awarding of 25-year service awards by the State. The club identifies itself with an emblem patterned after the emblem of the Division of Highways and many members proudly display this emblem in form of a wall plaque engraved with the member's name and the date he entered service with the division.

There are approximately 160 members in the Quarter Century Club at this time. Included in the membership are a number of retired employees of the Division of Highways who were active in the organization of the club. A drive has just been launched for the purpose of increasing this membership to a number more representative of the estimated 900 employees of the Division of Highways who have more than 25 years of service to their credit.

COST OF STORM DAMAGE

The total field cost of slide removal and storm damage repair financed by state highway maintenance funds was $1,257,056 for the 1953-54 Fiscal Year.

Turtle Club

Two Employees of Division Of Highways New Members

Franklin R. Saathoff and William D. Cruthirds recently became the first two employees of the California Division of Highways to be awarded membership in the Turtle Club. With the slogan "Shell on head—we're not dead" this exclusive intertional brotherhood allows as members only those who have escaped death or serious injury because they were wearing safety helmets.

Saathoff and Cruthirds, both of the District III (Marysville) staff, became eligible for membership while working as plant inspectors on the Elvas Freeway job near Sacramento.

Saathoff was struck in the head by a swinging clamshell bucket. The blow was strong enough to break away a section of his safety helmet and hospitalized him for several days, but the hat saved him from serious injury and perhaps death.

Cruthirds was struck on the head by a rock while standing beneath a mixing bin but, like Saathoff, he escaped serious injury.

Cruthirds admits that he learned the vital message of safety-every-minute the hard way. A few weeks before, he had been struck by a falling rock when he walked back under the mixing bin for a few moments without wearing his safety helmet. The accident hospitalized him for 11 days.

John Snider (center), Safety Supervisor for District III, examines broken helmet held by Franklin R. Saathoff which Saathoff was wearing when struck in the head by a swinging clamshell bucket. William D. Cruthirds (left) also escaped serious injury when a stone fell from a mixing bin and struck him on the head, putting a large dent in his safety helmet.

Both men received membership certificates, lapel pins and new hard hats with Turtle Club insignia from E. W. Bullard of San Francisco, international sponsor of the organibation.

In becoming members of the club all "turtles" pledge themselves to promote the constant practice of safety and the use of safety equipment.

The Turtle Club, organized in 1950 by C. R. Rustemeyer of Vancouver, now has members throughout Canada, the United States and the British Isles.

US 97 IMPROVEMENT

Continued from page 23 . . .

standards; however, right of way was secured of ample width for future four-lane construction throughout the entire length. The remainder of the project was stage construction in the ultimate design as the money available would permit.

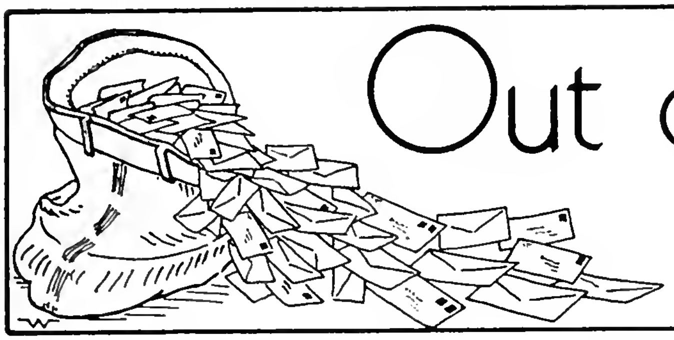
On account of ice and snow conditions on Route 72 during the winter months, the standard superelevations were reduced for safety reasons. An added feature for the safety and convenience of the motoring public was the "chain on and off areas" provided on each side of Dorris Hill. These areas permit the public to park off the traveled ways while putting on or taking off chains.

Eaton and Smith was the subcontractor on the grading operations and the previously mentioned firm of Clements Construction Company and Clements Company was the prime contractor.

The work was done under the direction of J. W. Trask, District Engineer, and George Barry, District Construction Engineer, with the writer as the resident engineer on the project.

SCHOOL BUS

Almost one-third of all school children ride to school in buses, reports the California State Automobile Association.



Out of the Mail Bag

PRAISE FROM TAIWAN

TAIWAN HIGHWAY BUREAU
Taipei, Taiwan

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: Thank you very much for your kindness in sending me and our library your fine magazine, the California Highways and Public Works. We all enjoy it very much.

After I finished my training program in the United States, I visited four countries in Europe. They are France, Belgium, West Germany and Italy. But I found that your freeway and magazine are the best in the world.

With my best wishes,
Sincerely yours,
WEN-TAO CHANG
Bridge Engineer
Taiwan Highway Bureau

FROM FRANCE

REPUBLIQUE FRANCAISE
Monsieur Rene Malcor
Ingenieur en chef des Ponts et Chaussees
Directeur Des Services Techniques
de la Ville de Marseille

K. C. ADAM, *Editor*

DEAR SIR: I have received *California Highways and Public Works* since November, 1952, and I have found in it the most valuable amount of information I ever found in any highway journal.

Following a trip in the States during which I had the opportunity to pay a short visit in California to Districts IV and VII, I will write in a French highway magazine an account of my visit, complete with summaries of some articles of your journal.

Yours very truly,
RENE MALCOR

MISSION TO IRAQ

EDWARDS, KELCEY AND BECK
Consulting Engineers
3 William Street, Newark 2, N. J.

California Highways and Public Works

GENTLEMEN: We have a mission of five highway engineers in Iraq. Their job is to develop a going highway department and assist in progressing an extensive highway program in that country. One of the problems to be dealt with by this mission is route numbering and highway cost accounting.

We understand that an article, entitled "History of United States Numbered Highways," by M. A. O'Brien, Highway Signing Supervisor, appeared in *California Highways and Public Works,* in the March-April and May-June, 1952, issues.

Would it be possible to secure this article or copies of the issues in which it appeared?

Very truly yours,
GUY KELCEY

KIND WORDS FROM WASHINGTON

WASHINGTON
STATE HIGHWAY COMMISSION

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: Your magazine is the outstanding one in the field and you deserve commendation for showing the way. A publication of this type would be a desirable goal of each highway department as a means of not only disseminating technical information, but also of reaching the public with the importance, magnitude, and impact of highway problems and developments.

Yours very truly,
J. K. MLADINOV
Senior Planning Engineer

WELL-EARNED PRAISE

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
Shasta-Trinity National Forests

J. W. TRASK, *Division Engineer*
California State Division of Highways
Redding, California

DEAR MR. TRASK: Please accept our many thanks for the fine work of Mr. Haley and Mr. McGovern of your maintenance section during the recent accident in which one of our employees, Marvin D. Taft, was involved.

Haley and McGovern were the first ones on the scene and by their quick and effective work could well have saved the driver's life had he not been so severely injured. The dispatch with which these men cared for Mr. Taft, before and after the ambulance arrived, calls for special mention. It is reassuring to know that we have a highway crew with men such as Haley and McGovern who are so willing to go far beyond their normal call of duty to provide help.

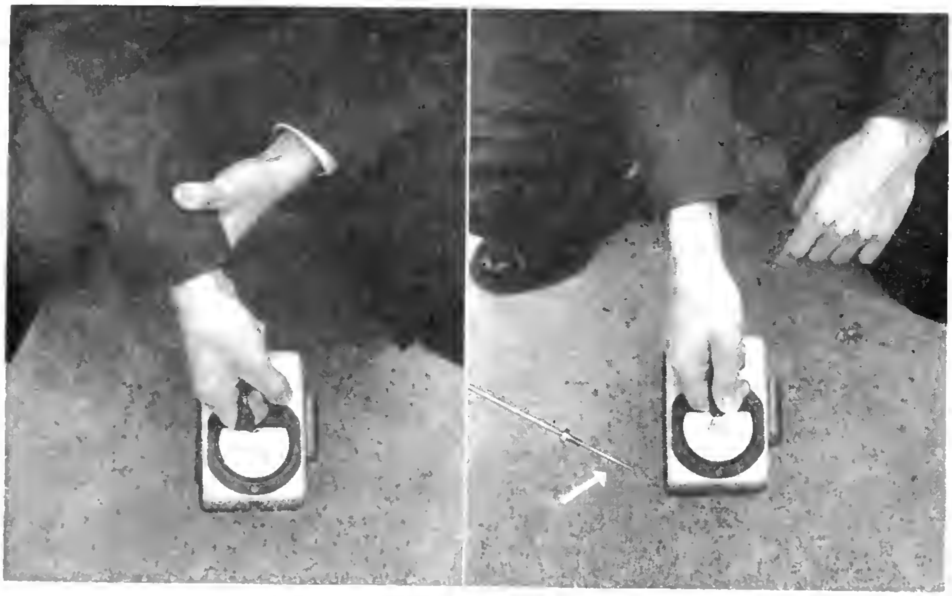
Please let these men know that the Forest Service is most appreciative of their help. We hope some day to be able to return their kindness. A note of thanks is also due your fine dispatcher and others in your organization who make the job "click" when they are needed most.

Very truly yours,
PAUL W. STATHEM,
Forest Supervisor

AUTOMOBILES ENTERING STATE

A total of 216,416 automobiles entered California during January, 1955, as compared with the 200,041 that entered during January of 1954, reports the National Automobile Club.

Radiological Monitoring Classes Being Held



The two photos show a Jordon Ion Chamber with (left) the needle at zero and (right) registering the amount of radiation emitted by some radio-activized metal (white arrow) held near it

In keeping with the intensification of the Nation's atomic defense program, the State Division of Highways now is training some of its employees in the use of radiological monitoring methods and equipment.

These men, most of them highway superintendents, are being instructed in the use of ion chambers capable of recording radiation at any time and place.

The classes are being conducted by Harvey A. Towne, assistant maintenance engineer, and Carroll T. Berry and Ralph Zook, assistant safety engineers. Towne, Berry and Zook recently completed an intensive training course in radiology conducted by the State Office of Civil Defense in San Diego.

The course being given to Highways personnel throughout the division's 11 districts takes two days and includes basic radiological theory as well as use of the ion chambers. After completing the course, the highway superintendents are equipped with ion chambers which they carry with them as they make their rounds of the roads under their jurisdiction. If they detect any signs of radioactivity they will report to their headquarters via the two-way FM radios in their vehicles.

State-wide Coordination

State-wide coordination of the monitoring activity will be effected through the district and Sacramento Headquarters offices. Each district maintains contact with a regional civil defense office, and headquarters with the Office of Civil Defense in Sacramento.

The chief danger from radiation is from radioactive fall outs—the contamination of an area from falling or drifting radioactive material. A good example is the recent series of atomic bomb tests at Yucca Flat in Nevada. On a few occasions a limited drift of radioactive particles was recorded across sections of Southern and Central California.

With ion chamber-equipped vehicles now patrolling state highways, it will be possible to detect the presence of such radioactivity and its amount so that the flow of traffic can be controlled through the contaminated area.

The ion chamber, a small metal box measuring 5 x 5 x 3½ inches and weighing 3½ pounds, can register the presence of radioactivity between .0005 and 500 roentgens.

Types of Exposure

An exposure of 200 roentgens would prove fatal to some people not in good health; a 400 roentgen dosage would kill half the people in an affected area and 600 roentgens would be enough to kill everyone.

However, sustained exposure to much smaller quantities can also prove injurious or even fatal. For example, the normal maximum industrial dosage for anyone working with radioactive material for a day is 0.050 roentgens. Above that, the cumulative effect could prove harmful.

The ion chambers, which will be used by Highways personnel, are not as sensitive as geiger counters in recording the lower, nonharmful amounts of radiation, but possess a much greater range. Most geiger counters do not record high enough to be of use in an explosion area.

John Chaffee Is Given Promotion In District V

John M. Chaffee, Assistant Construction Engineer of the California Division of Highways, has returned to San Luis Obispo to assume the position of Assistant District Engineer of District V. He will take over the administrative duties formerly handled by the late John W. Corvin.

Chaffee came to work for the division in 1928. Except for a few months during that year when he served as an inspector on highway construction in District I at Eureka, all of his service with the division was in District V until his promotion to the Sacramento headquarters office in 1952 as Assistant Construction Engineer.

In District V, following several years as construction inspector and resident engineer, he served successively as Assistant District Maintenance Engineer, Assistant District Office Engineer and, from 1947 to 1952, as District Office Engineer.

BRIDGE REPAIRS

Maintenance work and repairs, not including painting, on the 5,047 bridges on state highways cost $375,000 during the 1953-54 Fiscal Year. Work in the nature of minor bridge improvements was performed at a cost of $220,000.

State Highway Contracts Awarded

JANUARY, 1955

Contra Costa County—FAS County Route 800—Between Oak Grove Road and Clayton Road, near Concord, on the Ygnacio Valley Road. Construct a graded roadbed and surface with plant mixed surfacing on untreated base and selected material, 4.4 miles. Awarded to Transocean Engineering Corp., Hayward, $547,527.95.

Contra Costa County—SR 21—At Martinez. Repair of existing ferry slip. Awarded to Healy Tibbitts Construction Co., San Francisco, $16,986.75.

Imperial County—US 80—Between Winterhaven and the Colorado River. Construct a graded road bed, surface with plant mixed surfacing on cement treated base and imported base material, apply seal coats and construct a welded plate girder bridge, 0.8 mile. Awarded to Silberberger Construction, Inc. & J. B. Stringfellow Co., Riverside, $386,-886.80.

Kern County—US 399—At the intersection of Date and Harrison Streets. Install two pipe culvert cross drains. Awarded to Oilfields Trucking Co. & Phoenix Const. Co., Inc., Bakersfield, $3,517.

Los Angeles County—Long Beach Freeway—Between 0.1 mile south of Willow Street and 0.2 mile north of Del Amo Boulevard, in and adjacent to the City of Long Beach. Grade a ramp and frontage road and place plant-mixed surfacing on untreated base, construct a retaining wall and furnish and install highway lighting and illuminated sign system. Awarded to J. E. Haddock, Ltd., Pasadena, $48,643.80.

Los Angeles County—Harbor Freeway—Between Figueroa Street and Olympic Boulevard in Los Angeles. Prepare and plant areas, install water system and furnish and plant ground cover plants, 1.0 mile. Awarded to D. & M. Sprinkler Co., Long Beach, $31,499.75.

Los Angeles County—US 99—Between Brand Boulevard and Sonora Avenue, on San Fernando Road. Modify this existing interconnected pretimed signal systems and install highway lighting. Awarded to C. D. Draucker, Inc., Los Angeles, $40,598.

Marin County—SR 1—Between five miles south of Stinson Beach and 1.2 miles south of the Sonoma County line. Replace the existing culverts, place plant-mixed surfacing on untreated base, construct head walls, drop inlets and repair shoulders, end walls. Awarded to Chas. S. Moore, San Jose, $12,-706.40.

Monterey County—SR 117—Near Corral de Tierra Road, about 7.5 miles southwest of Salinas. Place imported subbase material on the existing roadbed, place untreated base, surface and plant-mixed surfacing and apply seal coats, 0.2 mile. Awarded to Granite Construction Co., Watsonville, $18,538.

Orange County—At the intersection of Lincoln Avenue with Brookhurst Street and Euclid Avenue, in and adjacent to the City of Anaheim. Furnish and install complete in place full traffic-actuated signal systems and highway lighting. Awarded to Galland Electric Co., South Gate, $18,071.55.

Riverside County—SR 71—Between Junction Route 78 and San Jacinto River, 11.0 miles. Place imported borrow and imported base material, construct cement treated base, place plant-mixed surfacing and apply seal coats and construct a reinforced concrete bridge, completion of which provides a four-lane divided highway on new alignment with Route 77/78 Separation. Awarded to E. L. Yeager Co. & J. A. Payton, Riverside, $1,143,-442.21.

San Bernardino County—US 91, 466—At Baker Maintenance Station, 1.3 miles northeasterly from Baker, drill and case a well. Awarded to J. B. Henderson & Sons, Corona, $2,200.

San Diego County—On Cabrillo Freeway at Mission Valley Interchange. Grade and surface a speed change lane with plant-mixed surfacing on concrete base and imported subbase material, 0.1 mile. Awarded to R. E. Hazard Contracting Co., San Diego, $7,995.95.

San Francisco County—SR 1—At Park Presidio Tunnel, remove the existing tunnel lighting luminaires and install a fluorescent lighting system, construct a louver across the top portion of the arch and paint the face of the south portal and adjacent wing walls. Awarded to Ets-Hokin & Galvan, San Francisco, $99,811.

San Joaquin County—US 99—Between 0.2 mile west of Austin Road and North Avenue, near Manteca. Furnish and install complete in place, highway lighting and illuminated signs. Awarded to Collins Electrical Co., Stockton, $27,777.77.

San Joaquin and Sacramento Counties—US 99—Between Jahant Road and 0.5 mile north of Sacramento County line. Grade and pave with concrete pavement and construct four bridges, completion of which provides a four-lane divided highway with a steel bridge at Collier Road Overcrossing, a steel bridge at Liberty Road Overcrossing, a reinforced concrete bridge at South Channel Dry Creek, and a reinforced concrete bridge at North Channel Dry Creek, 3.4 miles. Awarded to M.J.B. Const. Co. & Lord & Bishop, Inc., Stockton, $1,036,230.

San Luis Obispo County—US 101—Between 1.5 miles west of Santa Margarita and Atascadero. Grade roadbeds and place portland cement concrete pavement; grade ramps, approach and frontage roads and place plant-mixed surfacing; construct six bridges and a pedestrian underpass; install highway lighting and illuminated signs, completion of which provides a four-lane divided highway on new alignment together with a steel bridge at Route 58/2 Separation, Santa Rosa Road Overcrossing, two parallel bridges at Route 2/125 Separation and at Traffic Way Undercrossing; concrete bridges at Santa Margarita Creek and Atascadero Creek and a pedestrian undercrossing at Atascadero Creek, 9.3 miles. Awarded to Madonna Construction Co., San Luis Obispo, $2,964,679.20.

San Luis Obispo County—SR 41—Between one mile west and two miles east of Estrella River. Grade and surface with plant-mixed surfacing on cement treated base and construct a steel bridge, completion of which provides a highway on new alignment, eliminating curves, with a bridge across the Estrella River, 2.9 miles. Awarded to John Delphia, Patterson, $476,821.

Santa Barbara County—US 101—Between Miramar Avenue and Park Place, in and near the City of Santa Barbara. Grade and pave with portland cement concrete on cement treated subgrade and with plant-mixed surfacing on cement treated base and construct six reinforced concrete bridges and one reinforced concrete pedestrian undercrossing, completion of which provides a four-lane divided highway with interchange lanes, frontage roads and acceleration and deceleration lanes, at San Ysidro Road Overcrossing, bridge across Montecito Creek, Montecito Creek Bridge, East Olive Mill Road Overcrossing, Olive Mill Road Overcrossing and Route 2/150 Sparation, 2.4 miles. Awarded to Guy F. Atkinson Co., South San Francisco, $1,565,-103.55.

Santa Cruz County—SR 9—At four locations on River Street, remove the existing wooden culverts, and replace with concrete valley gutters; reconstruct portions of the existing street to conform with new gutter. Awarded to Granite Construction Co., Watsonville, $2,357.

Shasta County—FAS County Route 1176—Between 0.5 mile south of Igo and 2.6 miles west of Girvan. Grade, place imported subbase and base material, surface with untreated surfacing and construct a welded plate girder bridge with reinforced concrete deck and a reinforced concrete box culvert, 6.2 miles. Awarded to Claude C. Wood Co., Lodi, $359,825.60.

Siskiyou County—SR 96—At Clear Creek, 8.4 miles southwest of Happy Camp. Construct an honor camp including roads, water system, electrical system, sanitary system, gas fuel distribution system and buildings. Awarded to B. & R. Construction Co., San Francisco, $259,488.

Tulare County—SR 134—Across Inside Creek and Outside Creek, about seven miles east of Tulare. Widen the approaches and two bridges across Inside Creek and Outside Creek. Awarded to Thomas Construction Co., Fresno, $18,575.

FEBRUARY, 1955

Contra Costa County—Between Martinez Road and Willow Pass Road, on the Arnold Industrial Highway, at various locations. Remove and repair pavement surfaces with cement treated bases at bridge approaches, 0.2 mile. Awarded to Marchio-Baker-Trewhitt Co., Inc., Antioch, $17,370.

Del Norte County—US 101—Between 11.5 miles south of Crescent City and 8.3 miles south of the Oregon state line, at various locations. Remove existing guard railing and construct new metal plate guard railing, 0.3 mile. Awarded to F. B. McNear, Oakdale, $5,428.50.

Humboldt County—US 101—Across Big Lagoon, about 10 miles north of Trinidad, repair the existing bridge. Awarded to Chas. I. Cunningham Co., Oakdale, $8,865.

Kern County—US 466—At Bena and Lomond cattlepasses about two miles east of Bena. Replace existing timber cattlepasses with earth fills. Awarded to Geo. E. France, Inc., Bakersfield, $5,570.25.

Kern County—US 466—Between one-fourth mile west and one-fourth mile east of Caliente Road. Construct a graded roadbed and surface with plant-mixed surfacing on cement treated base and construct channelization connections and approacbes, 0.5 mile. Awarded to Dicco, Inc., Bakersfield, $41,988.

Los Angeles County—San Bernardino Freeway—Between 0.3 mile east of Citrus Avenue and 0.2 mile east of Ganesha Boulevard. Grade and pave with portland cement concrete on cement treated subgrade, place plant-mixed surfacing on selected material on frontage roads and connections, construct a reinforced concrete bridge and two undercrossings, completion of which provides a four-lane divided highway with bridges at Walnut Creek Bridge Widening, via Verde Undercrossing and at Holt Avenue Undercrossing, 5.2 miles. Awarded to Winston Bros., Monrovia, $2,210,075.50.

Los Angeles County—At the intersections of Atlantic Avenue with Compton Boulevard with Rosecrans Avenue and with Brompton Avenue and Bell Avenue. Furnish and install or modify traffic signal systems. Awarded to Westates Electrical Const. Co., Los Angeles, $10,930.

Los Angeles County—SR 15—Between Slauson Avenue and 0.3 mile south of Atlantic Boulevard (portions), 0.5 mile. Excavate a "glory hole" and construct a steel railroad bridge and drainage facilities. Awarded to Oberg Bros. Const. Co., Inglewood, $219,721.

Los Angeles County—Near South Gate, at the intersection of Firestone Boulevard with Rives Avenue, improve intersection by constructing curb returns, removing portland cement concrete box culvert and junction chamber, removing two palm trees and placing plant mixed surfacing, and install a complete in place coordinated semi-traffic-actuated signal system and highway lighting. Awarded to Electric & Machinery Service Inc., South Gate, $10,-889.25.

Los Angeles County—SR 179—Across Los Cerritos Flood Control Channel, on East Seventh Street, at Studebaker Road, about one mile east of Long Beach. Construct a reinforced concrete girder across Los Cerritos Channel, and approaches. Awarded to C. B. Tuttle, Los Alamitos, $72,462.25.

Mendocino County—US 101—At Leggett Valley Maintenance Station. Construct a gasoline and oil house, and a grease rack. Awarded to S. W. Kellog, Willits, $4,036.46.

Merced County—SR 152—Across Twin Canals and Los Banos Creek, between west city limits of Los Banos and 1.5 miles west. Widen three concrete bridges at Twin Canal, another at Twin Canal and at Los Banos Creek. Awarded to Gene Richards, Inc., Fresno, $51,874.

Orange County—Santa Ana Freeway—Between Lewis Street and Broadway, 2.7 miles. Construct a graded roadway and surface with portland cement concrete pavement and construct 11 bridges, completion of which will provide a four-lane divided highway with reinforced concrete bridges at Placentia Avenue Overhead, Chapman Avenue Off-Ramp Undercrossing, a pair at Chapman Avenue Undercrossing, a pair at Chapman Avenue On Bamp Undercrossing, one at Chapman Avenue On-Ramp Undercrossing Pumping Plant, at Widening Bridge across Santa Ana River, Bristol Street Overhead, Bristol Street Overcrossing, widening bridge across Santiago Creek, left frontage road bridge across Santiago Creek and a steel bridge at Chapman Avenue Underpass. Awarded to Griffith Co., Los Angeles, $2,817,519.90.

Riverside County—US 60—Between Moreno and four miles west of the junction of Route 26. Widen the existing roadbed by grading and placing plant-mixed surfacing; grade and surface road approaches, road connections and cross-overs; place wire mats and perform slope erosion control work on embankment slopes; place stone riprap as channel lining; construct drainage facilities, completion of which provides a new four-lane divided highway, 5.2 miles. Awarded to Matich Bros. & Matich Bros. Paving Co., Colton, $748,257.

San Benito County—SR 156—At Tequesquito Slough, about 4.5 miles north of Hollister. Construct a graded roadbed, place plant-mixed surfacing and bases and construct a reinforced concrete bridge across Tequesquito Slough, 0.3 mile. Awarded to Baun Construction Co., Inc., Fresno, $37,868.45.

San Bernardino County—US 91-466—At Wheaton Wash Maintenance Station, 38 miles northeasterly from Baker. Drill and case a well. Awarded to Mel Meyer Co., Reno, $2,050.

San Bernardino County—At the intersection of US 66 and US 395 near Victorville. Furnish and install a highway lighting system. Awarded to Paul R. Gardner, Ontario, $2,743.

San Bernardino County—SR 18—Between 6.5 miles and 8.3 miles north of San Bernardino. Install metal plate guard railing, 0.7 mile. Awarded to Wulfert Co., Inc., San Leandro, $10,548.

San Diego County—Across San Luis Rey River, about 1.5 miles southwest of Lake Henshaw. Construct a steel bridge and approaches. Awarded to O. B. Pierson, Bellflower, $56,600.70.

San Diego County—SR 94—Between Euclid Avenue and 0.2 mile east of College Avenue. Grade and pave with portland cement concrete pavement on cement treated subgrade, place plant-mixed surfacing on cement treated base, imported base material or existing pavement, and construct four bridges at College Avenue Undercrossing, Broadway On-Ramp, Federal Boulevard On-Ramp Undercrossing, and 56th Street Overcrossing, completion of which provides a six-lane divided freeway, together with necessary ramps, interchange lanes and street connections, 2.8 miles. Awarded to Guy F. Atkinson Co., Long Beach, $1,620,049.55.

San Diego County—FAS 732—Between Alvarado Canyon Road and Brockton Street. Construct a graded roadbed, place plant-mixed surfacing on imported base material and portland cement concrete base and apply seal coats, 3.5 miles. Awarded to Daley Corp., San Diego, $609,849.50.

Santa Cruz County—At the sewage treatment plant in Big Basin State Park. Clean and paint the steel trusses and rotary sewage distributor over a trickle filter. Awarded to Chas. Murphy, San Francisco, $1,215.

Santa Clara County—At the intersection of Embarcadero Road and Bayshore Highway. Widen a portion of the existing highway and surface with plant-mixed surfacing on untreated base, portland

. . . Continued on page 64

EMPLOYEES RECEIVE TWENTY-FIVE-YEAR AWARDS

Employees of the Division of Highways who became eligible for their 25-year service awards on September 30, December 31, 1954, January 31, and February 28, 1955, are:

Name	Birthdate	Total service		
		Yrs.	Mos.	Days
ELIGIBLE ON SEPTEMBER 30, 1954				
Shop 5				
Nevins, Vernon J...	8-12-08	25	0	21
ELIGIBLE ON DECEMBER 31, 1954				
District I				
Brewster, Henry Elmer....	9-13-09	25	0	8
District II				
Saunders, Fred S., Jr......	7-17-10	25	0	6
Weaver, Earl	12- 8-05	25	0	11
District III				
Christman, Louis E.......	3-30-12	25	0	14
District IV				
Ives, Thomas H..	2-21-92	25	0	14
Simmons, Albert E.......	7-27-05	25	0	29
Spence, James A........	6-24-03	25	0	22
Hite, Webster C.........	3- 3-04	25	0	25
District V				
Funk, Luther L..	6-26-01	25	0	29
Bender, Herman J........	11-27-02	25	0	12
Canham, Clarence C......	11- 3-02	25	0	9
District VII				
Van Voorhis, L. Sherrill..	3-18-10	25	0	17
Hawkins, Fred K.........	3-22-86	25	0	23
Sheff, Vaughn O........	8-18-00	25	0	9
District VIII				
Cox, Walter L...........	3- 6-86	25	0	9
District X				
Connor, James..........	1-23-02	25	0	16
Shop 8				
Prentice, Virginia........	8- 1-10	25	0	29
Materials and Research Dept.				
Bennett, William S.. ...	12-27-99	25	0	29
ELIGIBLE ON JANUARY 31, 1955				
District I				
Dunton, Mose .	3-02-09	25	0	11
Hart, Alan S....	12-07-07	25	0	16
Stebbins, Ben... ...	6-16-13	25	0	9
District II				
Leoni, Francis F.	2-03-03	25	0	26
Warren, Harvey E........	2-18-95	25	0	28
District IV				
Strehlow, Albert W......	1-25-04	25	0	23
District VII				
Fletcher, Joyce	4-23-07	25	0	19
Gallagher, Bernard M. ...	12-29-87	25	0	21
Holzman, Zelik..	5-12-07	25	0	28
Stuart, Joe A....	8-30-05	25	0	3
District VIII				
Adema, Philip.. .	4-06-04	25	0	4
Maynard, Henry E... .	11-21-02	25	0	12
District IX				
Cummings, Raymond C. ..	1-20-00	25	0	25
District XI				
Schilling, Ernest H. .	5-23-90	25	0	14
Central Office				
Fenwick, Kenneth M.. .	11-08-03	25	0	10
Reynolds, Lloyd B.... .	11-25-98	25	0	20
Materials & Research				
Nelson, Merle L.	9-06-08	25	0	28
Headquarters Shop				
Rider, Graham G.	11-05-07	25	0	26
ELIGIBLE ON FEBRUARY 28, 1955				
District I				
Trapier, James H...... ..	12-21-05	25	0	19
District II				
Carpenter, Walter V......	3-06-05	25	0	15
Robrecht, Augustus A....	12-24-08	25	0	5
District IV				
Campbell, Jack C.. ...	8-13-07	25	0	11
Rothermel, Ted	10-12-08	25	0	12
Summers, Harold A......	11-06-99	25	0	26
District V				
Evans, Paul E............	2-18-04	25	0	17
District VIII				
Dufrain, A. Frank.......	5-10-93	25	0	26
Goode, L. Maynard ...	11-27-08	25	0	27
Lakes, Curtis... ..	1-17-09	25	0	27
District XI				
Frazee, Donald B..	5-04-99	25	0	16
Central Office				
Lusich, Minerva..	3-20-08	25	0	0
Milton, R. E.	2-02-06	25	0	22
Mitchell, M. H..	1-17-03	25	0	26
Bridge Dept.				
Hutchinson, Ralph W.....	12-29-02	25	0	19
Sagehorn, Ernest H.......	7-16-03	25	0	23
Shop 2				
Henriques, Anthony R. .	8-06-92	25	0	0
Headquarters Shop				
Martinson, A. Oliver ...	7-01-97	25	0	15
ELIGIBLE ON MARCH 31, 1955				
District II				
Coffin, William C.......	4-13-11	25	0	11
Duffy, Phil F...	9-26-11	25	0	22
Eckholm, Arthur H......	3-18-00	25	0	11
District III				
Lumley, John W.	7-10-95	25	0	19
District IV				
Ball, Hartwell R.	4-12-03	25	0	6
District VII				
Black, Alex G.	11-08-93	25	0	18
Leonard, Harold W. ...	4-12-99	25	0	15
District VIII				
Hopkins, Robert D., Jr...	9-10-01	25	0	20
Norton, Richard O.......	1-30-07	25	0	3
Central Office				
Culley, William S........	1-22-08	25	0	24
Murphy, John P.........	1-29-06	25	0	17
Bridge Dept.				
Wagner, Richard A......	7-23-07	25	0	16
Materials and Research				
Zube, Ernest............	6-08-02	25	0	29
ELIGIBLE ON MARCH 31, 1955				
Central Office				
Harris, Milton	1-13-96	25	0	29
ELIGIBLE ON DECEMBER 31, 1952				
Nickerson, Merritt R. ..	7-06-97	25	7	25

PRESTRESSED GIRDERS

Continued from page 36 . . .

Overstress for Shrinkage

Stress in the cables at the time of inserting shims amounted to 115 percent of the final calculated working stress. At stress relieving force of approximately 130 percent was applied and held for two minutes before backing off on the shims at the 115 percent. The overstress of 115 percent was considered necessary to allow for shrinkage, creep, plastic flow and other factors which occur during or after prestressing operations which would ultimately reduce the original stress set in the cables.

Beams Raised at Night

Erection of girders was done at night thus causing the least inconvenience to the traveling public. Traffic was shunted down the Mission Road "off" ramp, across Mission Road and back to the freeways by way of the Summit Avenue ramps. This cleared the working area for both span No. 7 and span No. 4 on the separate beam raising nights. The equipment used for raising the beams was a 35-ton truck crane which lifted, carried and placed the girders into position. The lifting slings were fastened to the ends of the girders by means of a 1½-inch bolt passed through the lower hole provided in the ends of the girders for the diaphragm prestressing cables. Safety cables were attached to eyes cast in the top of and at three feet from the ends of the girders but this precaution appeared not to be necessary. The contractor's apprehension as to excessive limberness of prestressed girders was, with this particular design, found to be groundless. The girders proved to be very stiff.

After girders were in place the diaphragms were formed and poured between them at mid span and each end. Six wire high-tensile cables were placed through the diaphragms after the concrete had reached a strength of 2,000 pounds per square inch, and stressed. This was followed by the forming and pouring of facia girders and lastly by forming and pouring the deck and curbs.

A galvanized steel hand rail was placed on each side of the bridge and metal light poles set on the low side for illumination.

Freeway Connections Built

The final items of work on the contract consisted of backfilling the old tunnel area to a depth of approximately six feet thus restoring a normal grade at this point and placing three lanes of concrete paving for the westbound San Bernardino Freeway. This pavement also serves westbound traffic bound for the Mission Road "off" ramp. Short sections of plant-mixed pavement were required to be built for freeway connections to the east and south of the bridge.

The finished bridge rises above the multiple freeways in a graceful curve starting at the San Bernardino westbound freeway under the old Macy Street Bridge, up and over the six freeway roadways to a hilltop connection with the Santa Ana Freeway on the south. It reaches a height of some 45 feet near the center of the structure. The setting is in an area of shrubs, trees and green lawns crossed by the interweaving freeways and banked on the east by the ivy covered bluffs that once overlooked the Los Angeles River. It is a pleasing setting for an architecturally pleasing structure.

Congestion Alleviated

The project represents just one of the many steps being taken currently by the State Division of Highways to eliminate bottlenecks on the freeways and to ease the traffic situation in the congested metropolitan area. The use of prestressed girders was only one of the many details designed to speed this end.

The general contractor on this $465,433 contract was the Charles MacClosky Company. The Prescon Company furnished the prestressing cables for the contract. Other subcontractors were the Macco Corporation who handled pile driving and concrete removal, the Waterbury Company on steel railing, Schulman Electric Company on lighting, C. G. Willis & Sons and Clyde Wood & Sons on earth work and C. O. Sparks & Mundo Engineering Company on paving.

Design was under the supervision of F. W. Panhorst, assistant state highway engineer. Construction was under the general direction of J. E. McMahon, Bridge Engineer, Los Angeles, and G. L. Laird, Construction Engineer, Los Angeles. W. B. James was resident engineer with John Floryan, principal assistant. Leo Trombatore was district representative.

TWIN DRAGONS

Continued from page 53 . . .

the Fillmore and Santa Paula Chambers of Commerce. Among those attending were Assistant State Highway Engineer P. O. Harding and District Engineer W. L. Fahey, from District VII; C. H. Maghetti, secretary of the California Highway Commission; Lester Price, Chairman of the Board, Ventura County Supervisors; Robert Linville, mayor of Fillmore; John Barrington, mayor of Santa Paula; C. Leon Harthorn, city manager of Fillmore, and Fergus Fairbanks, master of ceremonies and one of Santa Clara River Valley's leading citizens over the years in working for the consummation of this project.

Motorists Will Save

The cost of construction was approximately $700,000. The cost of the right of way was approximately $100,000. It is calculated that the total cost of $800,000 will be saved by the motoring public in a five-year period as a result of the one-mile shortening of State Sign Route 126.

The contractor, R. R. Hensler, was represented by Mr. Glenn Burns, superintendent of bridges, and Paul Shaw, superintendent of road work. The State was represented by Hugh Whitnall, resident engineer under the general supervision of F. B. Cressy, district construction engineer, and his assistant, E. A. Parker.

Upon recommendation of State Highway Engineer George T. McCoy final acceptance of this contract, which extended for 2.4 miles, from 0.1 mile east of Lord Creek to State Sign Route 23 in the City of Fillmore, was made on February 28, 1955, by State Director of Public Works Frank B. Durkee.

NEW LUMINAIRE

Continued from page 51 . . .

30-foot pole capable of handling the wind load imposed by these units.

Installed on Burns Freeway

We do not intend to place any of these units in areas where freezing temperatures are normally expected. The handmade full-scale model indicated that this luminaire, with each of its two lamps backed by separate reflectors, will distribute a more uniform, relatively low-level illumination in a much more economical manner than our previous design. A comparison of isolux curves with a 10,000-lumen type V incandescent fixture shows that we get one foot-candle out further on the pavement with less wasted light on the side for 200 watts of fluorescent light than with 600 watts of incandescent light.

Thirty-two of these new units were recently installed on a section of the Burns Freeway, U. S. 101 in and near the City of Arcata in Humboldt County.

These units consist of a fiberglas housing with the polished aluminum reflector.

Field measurements show that the light output and distribution is equal to or in excess of that produced by the handmade model and approximates that of commercially available units which consume twice the power.

Field observation during wet pavement conditions shows that the pavement brightness pattern and resultant visibility far exceed that obtainable with conventional incandescent or mercury lamp sources. There is no objectionable glare.

BIDS AND AWARDS

Continued from page 62 . . .

cement concrete curbs and traffic bars. Awarded to O. C. Jones & Sons, Berkeley, $5,533.

Shasta County—US 99 Between Vollmers and 0.5 mile north of Lamoine. Construct graded roadbeds and surface with plant mixed surfacing on cement treated base and construct a steel bridge, to provide a four lane divided highway mostly on new alignment, 4.0 miles. Awarded to Piombo Construction Co., San Carlos, $2,314,554.20.

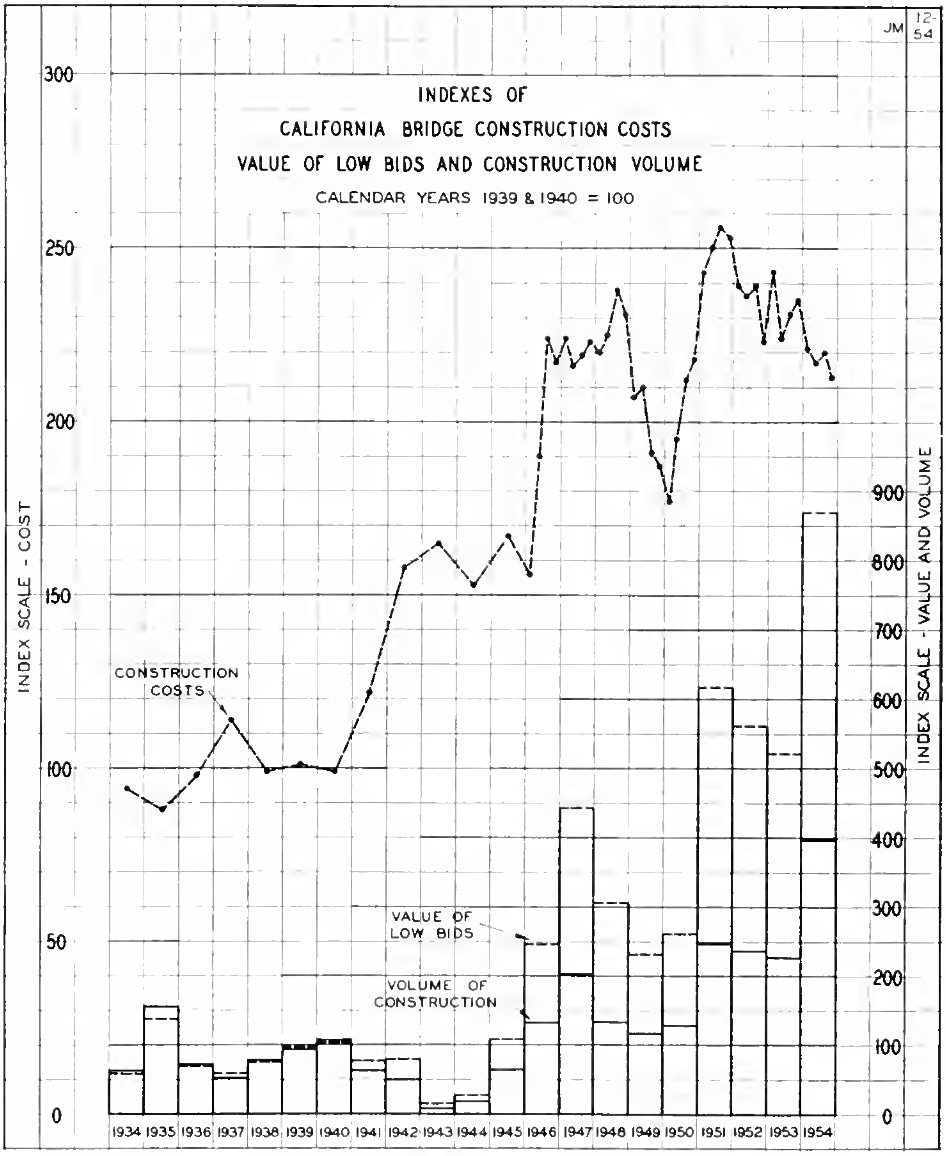
Siskiyou County—FAS 1166—Across Shasta River, about one mile east of Grenada. Construct a reinforced concrete tee girder bridge. Awarded to R. M. Skamnes, Sacramento, $26,275.50.

CALIFORNIA BRIDGES

Continued from page 55 . . .

year. Total construction is expected to increase 7 percent from the 1954 figure while highway construction is expected to rise 18 percent. A prolonged high level of highway construction is indicated in part by the present expanded federal aid program. Further increases in federal participation recently proposed by the President will, if enacted into law, greatly accelerate the program now scheduled.

With no indications of a major change in the current trend of labor and materials costs, and with the expected increase in the volume of work offered, the outlook for the coming year is for a termination of the recent local trend of decline and, possibly, moderate upward adjustments in bridge construction costs.



FILMSTRIPS ON HIGHWAYS

Division of Highways filmstrips now available for public showing include: "Freeway Bypasses," "Highway Communications," and "Operation Snowflake."

BRIDGE WORK INCREASED

Approximately $43,500,000 in highway bridges and bridge contracts were completed during the 1953-54 Fiscal Year, more than twice the amount for the previous fiscal year.

GOODWIN J. KNIGHT
Governor of California

FRANK B. DURKEE . . Director of Public Works

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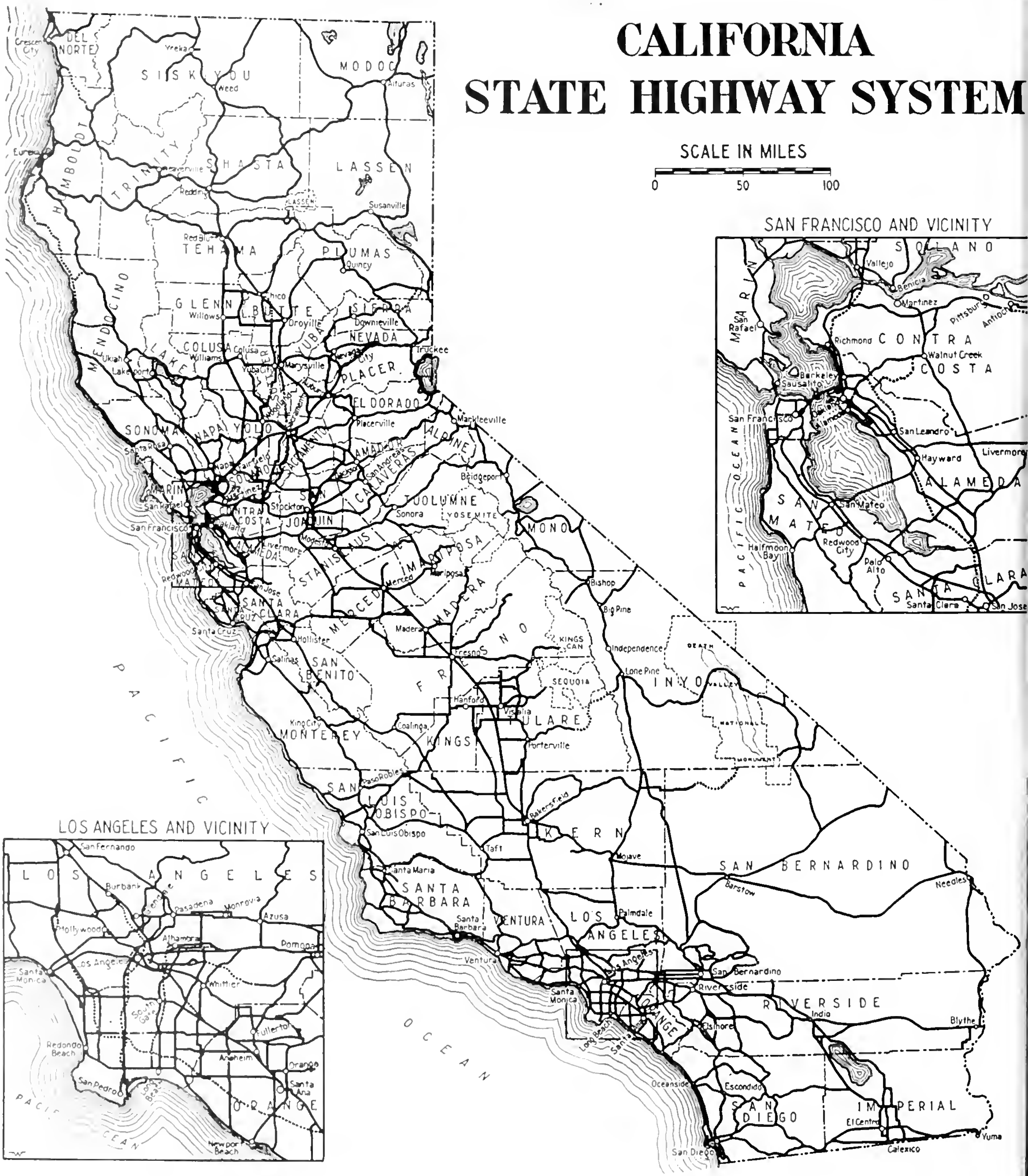

Oct. 1953

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MERRITT R. NICKERSON, *Chief Photographer*

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Sacramento

CONTENTS

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Address communications to

CALIFORNIA HIGHWAYS AND PUBLIC WORKS
P. O. Box 1499
Sacramento, California

Borrow Sites . . .

By SAM HELWER
Assistant District Engineer

Not Borrow Pits

Project on US 99 Presents Problems of Base Materials

Finding suitable sources of borrow material for building new freeway lanes and frontage roads through developed agricultural areas has become a major problem in California's accelerated highway construction program.

Earlier freeway projects, with very limited financing available, were of necessity undertaken in a sort of interrupted sequence on any one route. Under these circumstances the individual borrow source problems could be solved in stride. However, with more adequate financing permitting a speedup in closing the remaining gaps between freeway sections, the borrow material requirements have become far more complex.

Problem Acute

The problem of meeting these requirements has been particularly acute in the flat valley section of San Joaquin County through which US Highway 99 is being improved to four-lane divided standards. Starting with the recently completed freeway construction north of Ripon, and extending through to the northerly line of San Joaquin County at the Sacramento county line, the remaining two-lane sections of US 99 are being converted to full freeways in more rapid sequence.

The combination of terrain and adjacent agricultural development has made it very difficult to find a borrow material source, or even a combination of sources, that would furnish the quantities of suitable base and subbase materials required by the present rate of construction.

In solving this problem it is the aim of the Division of Highways to follow excavation practices which will not leave borrow sites detrimental to public interest. Every endeavor is made to leave the sites in such condition as to be actual or potential assets.

San Joaquin Example

How this was done in San Joaquin County is an example of what can be accomplished. By careful cooperative planning with county authorities it was possible not only to protect the natural resources but in some instances to leave the borrow sites in such a condition as to actually increase their potential agricultural productivity.

In addition to established Division of Highways procedures, local ordinances relative to excavation practices were observed in the location and development of suitable borrow material sources. The intent of such regulations is to prohibit excavation practices that might leave unsightly scars, water holes or swamps, or would otherwise destroy potentially productive agricultural land. To this end the San Joaquin County Planning Commission makes a detailed review of applications for excavation permits.

In view of the division's desire to cooperate with local agencies in these matters, the choice of an adequate borrow site of suitable material is generally limited to finding a large enough area of relatively high, unirrigable land in reasonably close proximity to the proposed construction project.

First Major Land Leveling Borrow Site

In the case of the first unit of the development of US 99 to full freeway standards—from north of Ripon to Austin Road, a marginal unirrigable almond orchard was offered as a borrow site by the property owner. About 365,000 yards of excess high ground was removed from approximately 68 acres for the construction of this section of US 99. The excavation operations have left this property in an irrigable state capable of greater productivity of more valuable crops, thereby adding to the economy of the entire community as well as creating a thoroughly satisfied property owner. The obvious economy and logic of the use of such a material site was aptly demonstrated in this instance.

The proposed rapid sequence of construction for US 99 on the Manteca By-pass and on into Stockton dictated that another borrow material source meeting the same general requirements, but on a much larger scale, be found immediately. Extensive search of the area within an economic haul radius revealed not a single source, or even an assembly of smaller sources, that would aggregate a sufficient quantity, except for a 261-acre property located adjacent to the southerly end of the proposed Manteca By-pass.

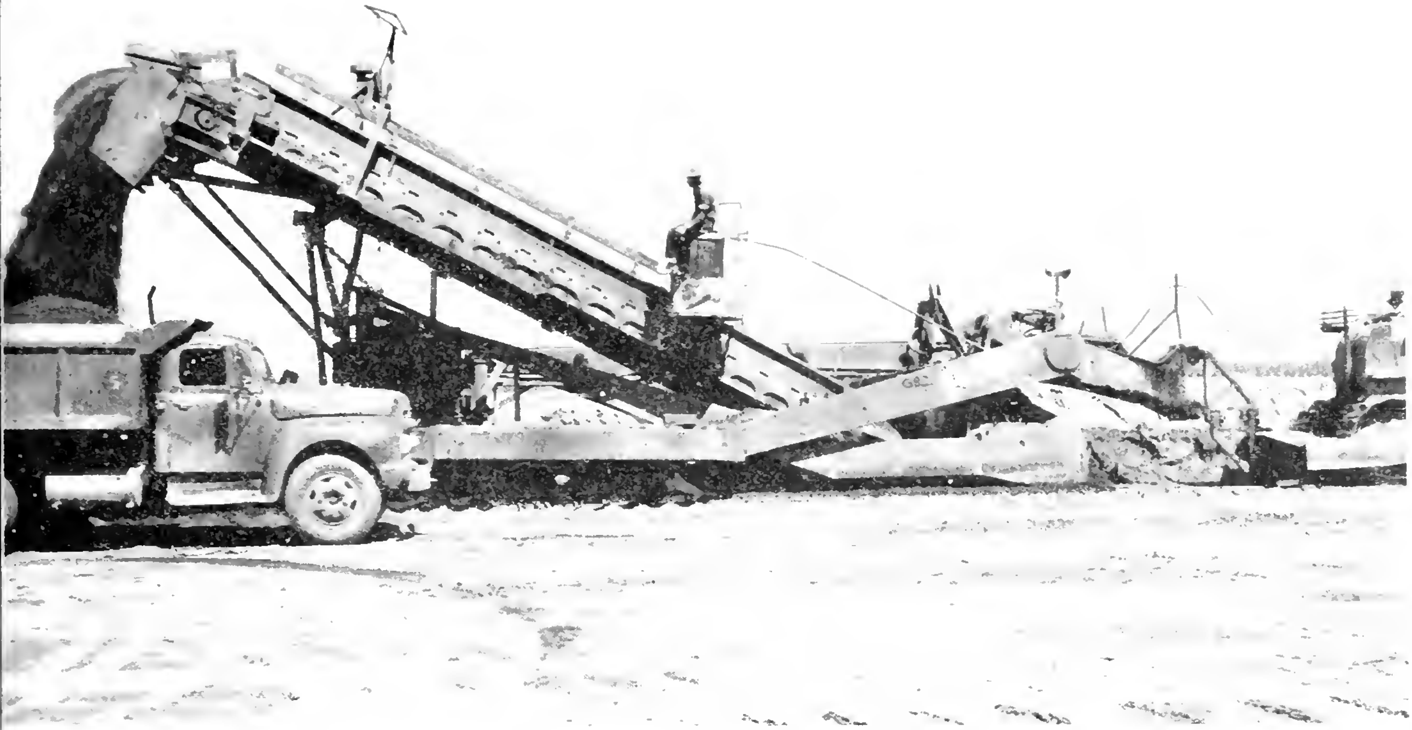
Borrow Site for Three Projects

This property, an old vineyard, was owned by a corporation that was more interested in raising grapes to furnish its winery than in furnishing material for the construction of a freeway. Surveys indicated that proper excavation practices would make about 1,300,000 cubic yards of high quality borrow material available for highway purposes.

Acquisition of this borrow material on a royalty basis was unsuitable to both the property owner and the State in this instance. Therefore, after proper setting up of appraisal authority and budget item for acquisition, negotiations were started for the purchase of the entire vineyard. This was accomplished without resort to condemnation procedures.

Using this site excavation operations for the Manteca By-pass project be-

UPPER Portion of site showing completed grading and sprouting of planted cover crop. LOWER View of completed grading and start of planted cover crop.



UPPER—Loading with a crawler-type belt loader pulled by a tractor. LOWER—Area of maximum cut showing high, previously unirrigable land being improved to an irrigable graded plane.

gan on October 1, 1954 and are now virtually completed. In addition to about 800,000 cubic yards used for this project, this site also will furnish all the borrow material (250,000 cubic yards) for the project from Turner Station to Kingsley Road (3.1 miles) which is now well under way (K. N. Hatch is the resident engineer on both projects). A third project which will close the gap in the freeway construction between these two projects will use up the balance of the borrow material from this source.

Irrigation Plan Approved

Before operations began, a plan was established that would permit irrigation of the property after the excess high ground had been removed. Grades were established for a 0.05 percent north-south fall from the existing irrigation canal on the south side of the site to form canals through the center of every 40-acre block, and with a 0.15 percent cross-fall irrigation grade east and west from these canals. While these irrigation canals are not completed by the construction operations, the entire area is staked and graded to leave a "pad" from which these canals can be constructed by future owners. After this plan was reviewed by the San Joaquin County Planning Commission, an excavation permit was issued.

Clearing Contrals and Operation

Since this property was a producing vineyard, it became necessary to control clearing operations to permit harvesting of crops to the maximum practical extent, ahead of clearing and excavation. The entire property was divided into blocks about 600 feet by 1,700 feet and the contractor was allowed to clear only one block at a time just ahead of excavation operations. A contractual agreement was made with the former owner to pay the State for crops harvested ahead of clearing. Originally it was believed that complete removal of the excess high ground would require several years; this period of time will now be reduced materially due to an accelerated construction program. Actual clearing has been performed, using a large tractor with a brush dozer. This equipment cleared at the rate of about five acres per day.

Crawler-type belt loader pulled by a tractor required push equipment in deeper cuts

Loading and Hauling

Material at the site was loaded by a crawler-type belt loader pulled by a tractor. The loader worked most economically when a two-three-foot bank was encountered. If less cut was encountered, production decreased due to longer loading time per unit of hauling equipment.

If larger cuts were encountered, more tractor push equipment was needed. At the height of hauling operations, hauling equipment carrying 40 to 45 tons was being loaded in 40-50 seconds, a truly economical mass production operation. Maximum tonnage for one eight-hour day was 12,250 tons; the average for the bypass project was 9,500 tons per day.

Borrow for the Manteca By-pass was hauled almost exclusively by off-highway bottom-dump trucks of 40-45-ton capacity. A total of 15 units of this equipment was in operation. In order to use this equipment, the contractor purchased easements for a haul road through two separate properties between the borrow site and the project. An overload permit was obtained from San Joaquin County by the contractor for overload equipment to cross over Austin Road; conditions of the permit required maintenance of the crossing during construction operations and restoration of the roadway on completion of the project. Another permit requirement was that a flagman be present at the Austin Road crossing at all times during construction operations. The average haul on this project was three miles, and the contract price for the materi was 34 cents a ton.

Average Haul Nine Miles

Hauling for the Turner Station Kingsley Road project is being carri on with 30 10-wheel end-dump truc carrying 13-ton legal loads and bottom-dump "semis" carrying 2 ton legal loads. All of this material being hauled over the existing sta highway. The average haul on th project is nine miles; the contra price for the borrow material is cents a ton. All of the material r moved is weighed on a platform sca of 70-ton capacity.

A comparison of borrow materi prices on the two going projects pr vides an excellent index of the cost hauling this material. Both projec used identical material from the san material site. The successful bidd on both projects was the same co tractor, A. Teichert and Sons, In The only difference has been in th haul; the average haul for the secor project was six miles greater for th second project. This indicates a hau ing cost of 6.33 cents per ton mil On large projects requiring 1,000,00 tons of borrow, which is quite com mon today, each mile increase in ha distance will increase the cost of th project by more than $60,000.

Quality of Material

The material deposit consists of ridge of loose sandy wind-modifie soils classified agriculturally in th Delhi and Hanford series. The Del

. . . Continued on page

Redwood Highway

Petaluma-Santa Rosa Freeway Progressing

By G. E. DILLON, Resident Engineer

CONSTRUCTION is now well under ay on the southerly portion of a ew freeway section of the Redwood lighway which will eventually ex-end from Petaluma to Santa Rosa. This will be a continuation of the 38 iles of existing and proposed free-ay leading northerly from San Fran-isco, over the Golden Gate Bridge hrough Marin County and to Peta-uma in southern Sonoma County.

Work began in the summer of 1953 vith a $400,000 contract, awarded to he firm of Ball and Simpson, for the mbankment approaches to the bridges o be constructed across Petaluma Creek and over the Lakeville High-vay and Northwestern Pacific Rail-oad lines.

Erickson, Phillips and Weisberg tarted work on the $850,000 high-evel, twin bridges across Petaluma Creek late in 1953 (see *California Highways and Public Works* for May-June, 1954). The structures are now completed and have been opened to the contractor's vehicles hauling ex-cavated material for continuing the embankment construction northerly from Petaluma Creek.

The stage was then set for awarding a road contract for the construction of a substantial portion of usable free-way. Parish Brothers and the Carl N. Swenson Company, Inc., were the successful bidders at $3,425,000, from a field of 13 who submitted proposals, for six miles of completed freeway extending from a point one mile south of Petaluma Creek to the Denman Interchange connection with the pres-ent highway, plus an additional two miles of grading. Work is now about 40 percent complete on this Petaluma By-pass section of freeway.

Retention of the extra half-cent of gas tax money and other propor-tionate taxes by the Legislature early this year permitted financing of the second major road contract approxi-mately a year earlier than might otherwise have been possible. Parish Brothers and the Carl N. Swenson Company were again low bidders, recently, at a figure of $2,140,000 for this project which will continue the freeway northerly from Denman to Wilfred crossing, four miles south of Santa Rosa. Plans are now being prepared for a future contract which will complete construction and con-nect with the south end of the exist-ing Santa Rosa Freeway.

Avoid Business District

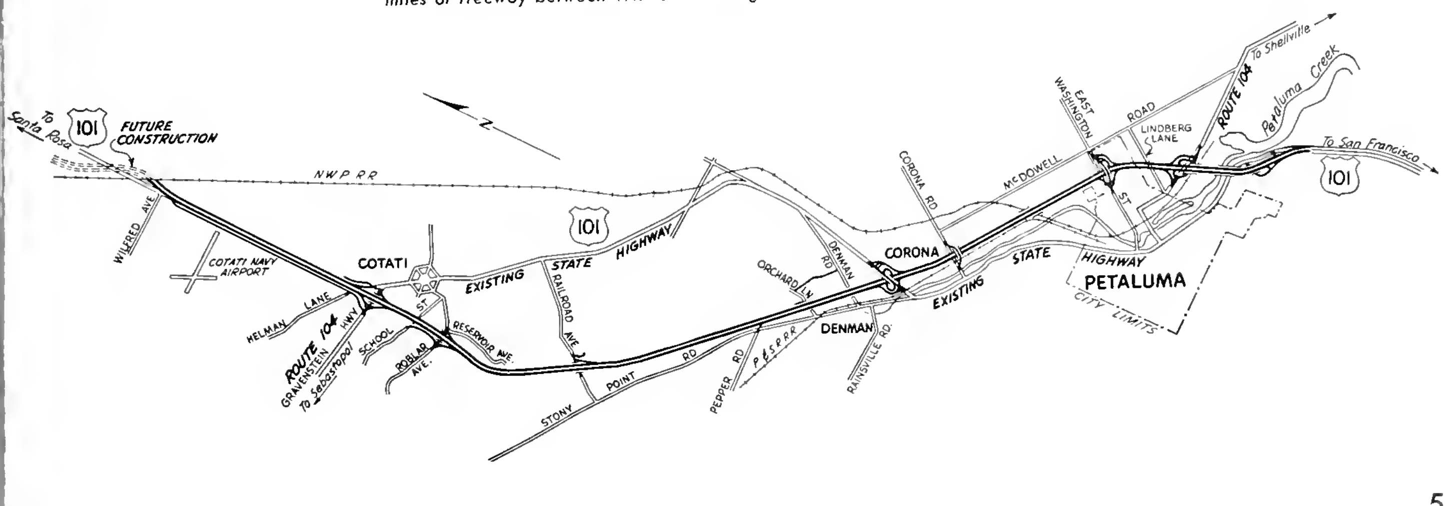
Historically, lines of communication approaching Petaluma from the south have been hemmed in by Burdell Mountain to the west and by Peta-luma Creek to the east, forcing roads to wind their way through the city of Petaluma rather than over the more direct and level terrain east of the city. The construction of the major high level structure across Petaluma Creek is the key to the successful relocation away from the busy downtown city streets.

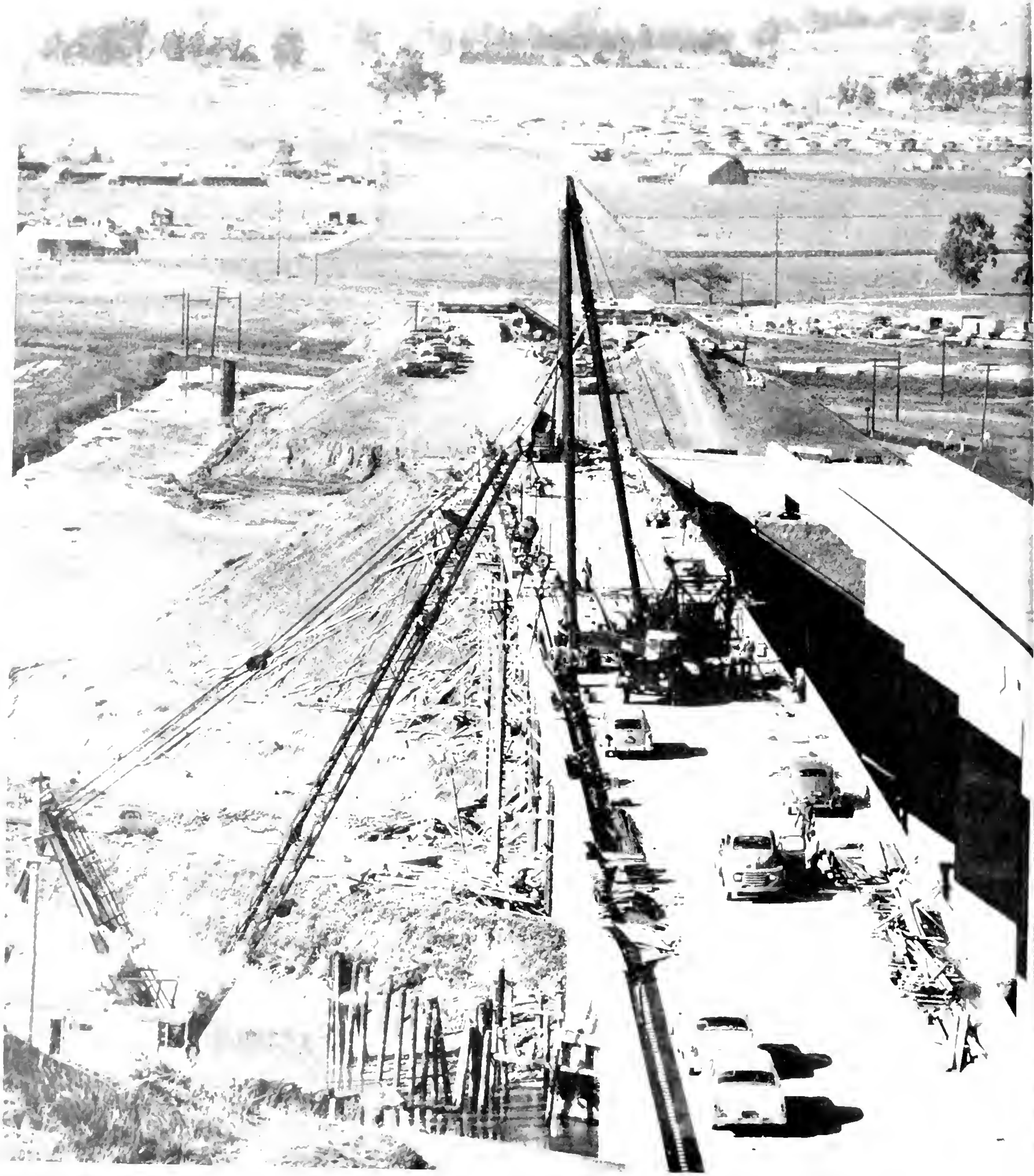
Steady population growth of Peta-luma combined with a sharp increase in highway traffic, especially since World War II, has dictated the need for a new traffic artery between Petaluma and Santa Rosa; the most pressing requirement being for the section bypassing Petaluma, through the main downtown streets, of which, the Redwood Highway has always passed. Traffic on the rural portions of this existing highway varies from 12,000 to 20,000 cars per day now.

Full Freeway Basis

This facility is being developed on a full freeway basis, that is, with com-plete control of access and with grade

Highway US 101 Freeway from south of Petaluma to Wilfred Crossing will stretch along this route when completed late in 1956. Work on plans for remaining 4½ miles of freeway between Wilfred Crossing and Santa Rosa are progressing.





Barge crane and A-frame lifting final precast girder into place on northbound bridge over Petaluma Creek. Route 104 separation and overhead visible behind Petaluma Creek Bridge. Freeway right of way shown curving to left in background, looking north. This and other photos by Petaluma Argus-Courier.

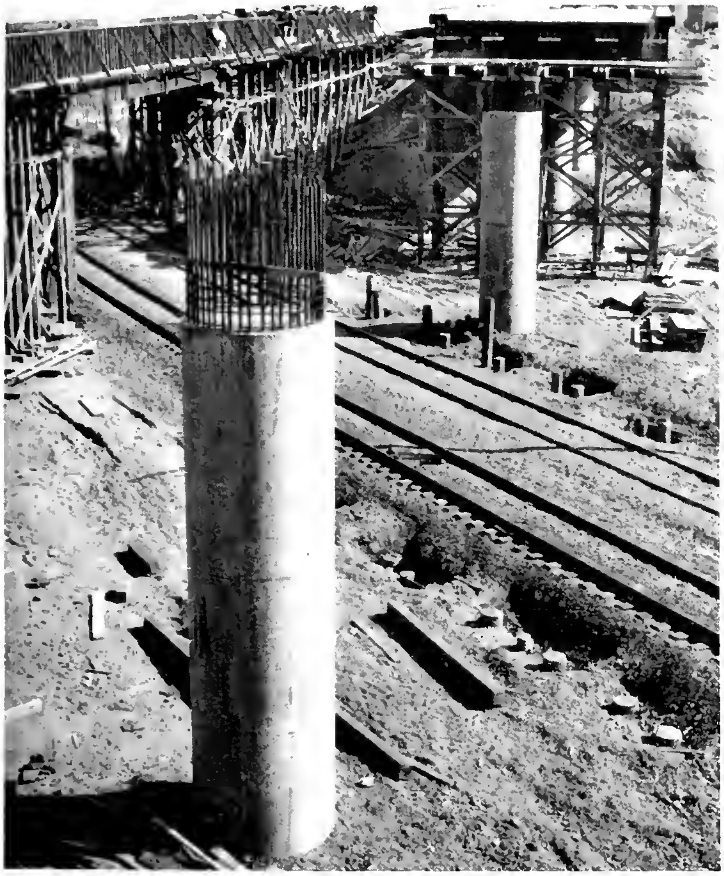
separations for all freeway crossings and left turning movements. Two 12-foot traffic lanes in each direction separated by a 40-foot division strip will allow for future expansion to six lanes when and if necessary at some future date.

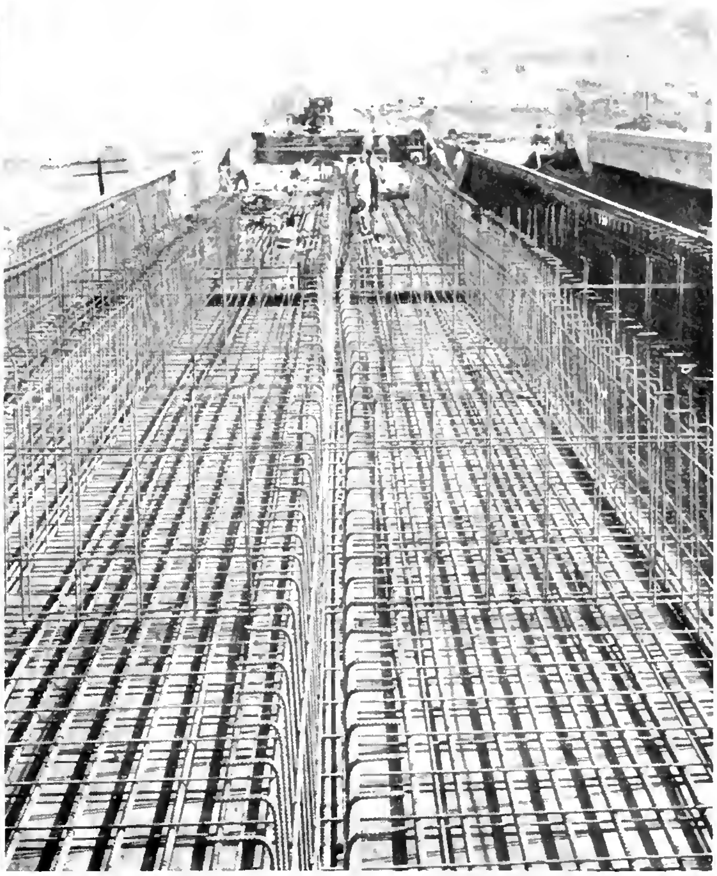
Freeway alignment was established with relatively few easy 2,500-foot minimum radius curves, ruling grades are 3 percent, and right of way width is 170-foot minimum.

the existing highway south of Petaluma Creek and going north there will be full interchanges at the crossing of the Lakeville Highway, at Washington Street in the City of Petaluma, and at Denman where the freeway crosses the existing Redwood Highway. There will be an on-ramp at Pepper Road, an off-ramp at Railroad Avenue south of Cotati, a partial interchange at Roblar Avenue in Cotati, and then a full interchange just

Illumination is planned at nearly all interchanges and important connections to the freeway. Fluorescent signs will be installed at the most heavily-traveled turnoffs.

Perhaps the most dramatic phase of construction so far has been the erection of the huge precast concrete girders of the Petaluma Creek twin bridge. The long center span of each structure was bridged with eight 110-foot concrete girders weighing over





LEFT—View of southbound bridge of separation and overhead, looking south. RIGHT—Setting steel in northbound bridge of Route 104 separation and overhead, looking south.

Structurally, the freeway consists of eight inches of portland cement concrete pavement on four inches of cement treated subgrade and six inches of selected material. Ramps and connecting roads are of plant-mixed surfacing on cement treated base and selected material.

Inasmuch as the artery is being developed on a full freeway basis, numerous interchanges have been planned to furnish complete flexibility of movement. Beginning with an interchange at the connection with

north of Cotati where the freeway crosses the Gravenstein Highway and rejoins the Redwood Highway. Between Wilfred and Santa Rosa, other interchanges are now in the planning stage.

Twenty-six Bridges

In connection with the construction of these interchanges and other road, creek, and railroad crossings; a total of 26 separate bridges are required at 15 different locations between Petaluma and Wilfred, ranging in length from 20 feet to nearly 900 feet.

70 tons each. The bridge contractor arranged with the Ben C. Gerwick Company to fabricate the tremendous beams in their Petaluma casting yard. The girders were barged down to a position below the span and carefully hoisted into place by means of a giant barge-mounted crane and a smaller A-frame working from the deck of the bridge. Completion of this important bridge opened the way for earth moving operations by the new direct route across Petaluma Creek to the heavy fills beyond

affording a shorter, more economical haul than the only other available route around through the downtown sections of Petaluma.

Two Parallel Structures

The next most important structure is the Route 1-104 separation and overhead which carries the freeway over the Northwestern Pacific Railroad tracks and the relocated Lakeville Highway. It is a reinforced concrete box girder bridge, consisting of two parallel structures, one 534 feet and the other 641 feet in length, each composed of eight spans supported by reinforced concrete abutments and piers with concrete pile foundations. Each structure will provide a clear roadway width of 28 feet between curbs. Work is now about two-thirds complete.

The recently completed Washington Street Overcrossing is a reinforced concrete bridge, 202 feet in total length, composed of two box girder spans and two slab spans, supported by reinforced concrete abutments and center bent with concrete pile foundations. The bridge will provide a clear roadway width of 28 feet between curbs and one 5-foot sidewalk.

The smaller bridges over Lynch Creek and Washington Street Creek have been completed and work on the off-ramp bridge across Washington Street Creek is in progress.

The other major bridges of the Petaluma Bypass contract at Corona Road, Denman Road and the North Petaluma Overhead are of the concrete box girder type. The three major bridges of the Cotati By-pass contract at Railroad Avenue, Roblar Avenue and the Gravenstein Highway (a second crossing of Route 104) are of the open concrete girder type.

Unusual Features

One of the most unusual features of the construction of the roadway itself is the large amount of grading and overhaul involved. On the Petaluma Bypass section, now in high gear, Parish Brothers will be moving a total of 1,400,000 cubic yards, an average of 1.6 miles for 110,000,000 station yards of overhaul. Nearly a third of this, moreover, will be hauled an even greater distance of about 2½ miles.

UPPER—Hoisting precast girders into place on northbound span of Petaluma Creek Bridge.
LOWER—Existing US 101 through congested main street in Petaluma.

At the south end of this project the contractor is using trucks and shovels partly because of the long haul, but principally because of the requirement that the movement of excavated material across the new Petaluma Creek Bridges conform to legal load restrictions. He has been moving an average of 8,000 cubic yards per double shift of 16 hours with a fleet of 15-yard, rear semidump trucks and two Northwest shovels. At the north end of the contract he has been moving an average of 4,000 cubic yards per nine-hour day with a fleet of 12 to 14 scrapers. So far, the rippers have been able to loosen all material and no drilling and shooting has been necessary.

Traffic Control Problem

Cut slopes generally are 1½ : 1 with 22-foot benches every 40 feet vertically at the north end where the maximum depth of cut is about 90 feet. The biggest cut at the south end has slopes of 1 : 1, with 30-foot benches every 60 feet vertically and a maximum depth of cut of about 130 feet. Most fills have variable slopes from 4 : 1 up to 1½ : 1 with a maximum height of 60 feet north of the Petaluma Creek Bridge.

To ease his traffic control problem, the contractor installed a complete traffic signal system at the point where the freeway crosses the existing highway at Denman. Control by one flagman from a vantage point in a tower affords efficient and equitable movement of traffic.

Drainage requirements were large in the vicinity of Willow Brook and across Denman Flats as far as Petaluma Creek. Several large culverts were designed to provide for sheet flood flow resulting from the occasional serious flooding of the entire valley when the creeks overflow their banks. At Washington Street, however, it was more economical to enter into a cooperative agreement with Sonoma County for the enlargement of the Washington Street Creek channel, thereby allowing flood waters to run off rapidly at a single location rather than in the form of sheet flow requiring several widely scattered culverts.

Underground Water Conserved

At one location the freeway cuts through a dairy ranch having natural springs which furnished water for stock. The owner's fear that the freeway would intercept and reduce this natural flow affected the establishment of the freeway grade line and resulted in certain measures to conserve all underground water from the freeway underdrainage system and train it to a point where the owner can collect it.

An innovation has been introduced as a paving alternate on the Cotati Bypass contract wherein concrete paving may be placed monolithically 24 feet wide in lieu of the usual 12-foot widths. Tie assemblies consisting of ½ by 30-inch bars will be placed mechanically to a depth of four inches and the longitudinal joint will be formed by sawing.

Major quantities on the Petaluma Bypass contract are: 1,400,000 cubic yards of roadway excavation, 107,000 tons of imported base material, 26,000 tons of plant-mixed surfacing, 32,000 cubic yards of concrete pavement and 14,000 cubic yards of structure concrete. Major quantities on the Cotati Bypass contract which was recently awarded are: 1,100,000 cubic yards of roadway excavation, 96,000 tons of imported base material, 25,000 tons of plant-mixed surfacing, 38,000 cubic yards of concrete pavement, and 4,200 cubic yards of structure concrete.

Changes in Contract

In an attempt to reduce the amount of construction engineering involved in accounting for pay quantities, a few changes have been made on the most recent contract under discussion, the Cotati Bypass project. The specifications for portland cement concrete pavement now state simply that no high subgrade will be allowed and that no payment will be made for extra concrete which must be placed to compensate for unavoidable low subgrade. This eliminates the necessity for time-consuming "stabbing" of the subgrade, i.e., measuring the thickness of the pavement by frequent rod readings before placing concrete, and only sufficient observations will be made as are found necessary to maintain a constant cement factor per lineal foot of pavement.

The quantity of concrete needed for all of the bridges in the contract as well as the quantity of reinforcing steel needed, is being bid as a lump sum instead of a unit price which relieves the bridge engineer of the tedium of hundreds of small and frequently involved calculations. Provisions are made for payment for any changes in plans during construction which alter the original amount of concrete or steel.

Concrete removal, another item which usually calls for considerable engineering measurement and calculating time, is being simplified by paying for pavement removal on a square yard basis and by including the other quantities of concrete removal in the prices paid for earthwork and for clearing and grubbing.

The schedule of construction calls for the freeway to be ready for traffic as far as Denman (Petaluma Bypass) by summer of 1956 and from Denman to Wilfred crossing (Cotati Bypass) by late fall of 1956. Completion of the remaining link between Wilfred crossing and Santa Rosa will depend on the rate future funds accumulate and are allocated for construction.

The Bridge Department Resident Engineer assigned to the Petaluma Creek Bridge was M. H. Jacobs. The work is under the general supervision of Assistant State Highway Engineer B. W. Booker and Assistant District Engineer R. P. Duffy with the author as resident engineer. Federal Aid funds contributed toward the financing.

LEFT—Constructing embankment. RIGHT—Shovel excavating cut.

NATIONAL PARK VISITORS REACH RECORD NUMBERS

National park areas drew nearly 48,000,000 visitors last year, the greatest number in history, and the total this year will likely reach 50,000,000, reports the California State Automobile Association. The attendance was 47,833,913 during 1954, an increase of 1,600,000 over 1953.

Totals for California's four national parks in 1954 were: Yosemite, 1,008,031; Kings Canyon, 511,541; Sequoia, 484,653; and Lassen, 282,443.

Elvas Freeway

Governor Opens Another Approach to Sacramento

By HELEN HALSTED, Assistant Editor

ELVAS FREEWAY, another approach to Sacramento across the American River from the north, was opened to traffic May 12th. The wooden barrier across the freeway at 30th and B Streets was symbolically removed by Governor Goodwin J. Knight, assisted by other state and city and county officials at 11 a.m. Short addresses were made by Governor Knight, H. Stephen Chase, State Highway Commissioner from Sacramento; Director of Public Works Frank B. Durkee, and Frank MacBride, Jr., President of the Greater Sacramento Chamber of Commerce. R. N. Crowell, Chairman of the Sacramento chamber's Highway Committee, was master of ceremonies.

GOVERNOR GOODWIN J. KNIGHT

Several hundred people witnessed the ceremonies and a motorcade lead by Governor Knight traversed the freeway northbound lane from 30th and B Streets and returned on the southbound lane onto 29th Street. Traffic immediately began streaming over the freeway and a traffic count showed that 11,273 northbound and 11,727 southbound vehicles used the new facility during the 24 hours from 3 p.m. Thursday to 3 p.m. Friday.

Governor Praises Cooperation

Governor Knight expressed his gratitude for the cooperation extended the State Division of Highways by Sacramento city and county in acquiring right of way for the project and said this area will be immensely benefited by the new highway. He praised the Department of Public Works and the Division of Highways, State Highway Engineer George T. McCoy and F. W. Panhorst, Assistant State Highway Engineer in Charge of Bridges, for a job well done and said the personnel of the department gives service beyond the call of duty. "They have an esprit de corps throughout their organization," he said. "They believe they are important people with an important job and they are right."

Knight, who had just returned from the conference of governors on President Eisenhower's national highway program, referred to California's preeminence in highway construction. He said that California is ahead of every other state in development of safety and good highways, and that in no other state can a motorist travel so many miles over such excellent highways and not pay tolls.

He expressed his satisfaction and pride in having reappointed H. Stephen Chase of Sacramento, first appointed a member of the State High-

HIGHWAY COMMISSIONER H. STEPHEN CHASE

Looking southwest toward Sacramento from above the interchange at Arden Way. The new Elvas Freeway (US 99E) curves off to the left to cross the American River and carry traffic into Sacramento at 29th Street, while the North Sacramento Freeway (US 40) runs off to right to enter Sacramento via 16th Street Bridge.

way Commission by former Governor Warren. "Certainly this great area should be represented on the commission," he said.

Freeway Important to County

Commissioner Chase said the Elvas Freeway is important to the entire county and added: "We of the highway commission and the Division of Highways realize how fortunate we are to have a Governor as well versed and interested in highway matters as is Governor Knight. Because he is so well-informed, his leadership is of the highest type. His personal contribution to solution of the highway problem has been enormous."

Director Durkee said he was very glad the Elvas Freeway job was completed and open to the public but cautioned that it is not the complete solution to the traffic problem in this area. He said: "It was the most pressing problem here when it was started in 1950 but I hope people will not conceive of it as the complete solution."

Durkee introduced several state officials including Fred Bagshaw, his assistant in the Department of Public Works; R. M. Gillis, Deputy State Highway Engineer; A. M. Nash, District III Engineer, Marysville; Milton Harris, Construction Engineer; Fred W. Panhorst, and Don Hislop, resident engineer on the project.

Also introduced were Harry Lord and Charles H. Wick, contractors representatives; Acting Mayor Bahnfleth, Sacramento; North Sacramento Mayor R. O. Mayes; Sacramento County Executive Charles W. Deterding, Jr.; Sacramento City Engineer D. J. Faustman; and Selden Menefee, vice president of the North Sacramento Chamber of Commerce; city councilmen, and supervisors.

Four-lane Full Freeway

The Elvas Freeway, will provide 2.9 miles of four-lane full freeway extending from C Street at 29th and 30th Streets in Sacramento to the North Sacramento Freeway at the junction of Arden Way-Swanston Road. The design includes provision for later development to six-lane standards.

Planning for the Elvas Freeway was initiated following completion of the Sacramento Area Traffic Survey conducted in 1947-48 by the Division of Highways in cooperation with the U. S. Bureau of Public Roads and city and county officials.

The survey report recommended:

"That immediate consideration be given to the construction of a new bridge and approach highways across the American River in the general vicinity of Elvas, connecting with the North Sacramento Freeway and Arden Way."

Following the publication of the report early in 1949 and public acceptance of the prime proposal, the Division of Highways made a detailed study of the Elvas routing. On March 22, 1950, the California Highway Commission adopted a routing from 29th and 30th Streets at C Street in Sacramento to the North Sacramento Freeway in the vicinity of Arden Way-Swanston Road, as recommended by State Highway Engineer G. T. McCoy.

Construction plans were advanced rapidly and the first contract was awarded and construction started in July, 1950.

Construction Units

The Elvas Freeway project includes the A Street Overcrossing in the City of Sacramento, parallel two-lane bridges 1,889 feet in length across the American River, two railroad separations (the B Street and Elvas Underpasses), a grade separation just north of the American River (State Fair Overhead), and structures for the interchange with the North Sacramento Freeway (U. S. 40-99E) and Arden Way-Swanston Road.

Work on the Elvas Freeway began in July of 1950 with the start of the contract for the substructure of the parallel American River bridges. The project suffered a severe setback in 1951-52 as a result of steel shortages. The advertising of the B Street and Elvas Underpasses and the superstructure of the two river crossings was delayed for a considerable time until steel priorities could be cleared. Final completion of the freeway project was delayed by unusually wet weather in the spring of 1955.

To construct the parallel spans of the Elvas Bridge, 10,681 cubic yards of structure excavation was required, and 11,287 cubic yards of concrete

View of Elvas Freeway taken few minutes after opening. Looking northeast from A Street Overcrossing.

were used in the structure and footings. Structural steel used totaled 2,233 tons and steel piling aggregated 43,798 lineal feet.

Heavy Excavation

Other structures on the freeway project involved a total of 22,700 cubic yards of structure excavation, 10,700 cubic yards of concrete, and 1,000 tons of structural steel.

Exclusive of structures, the freeway required approximately 240,000 cubic yards of roadway excavation, used 550,000 tons of imported borrow and was paved with 15,700 cubic yards of concrete and 13,500 tons of asphaltic surfacing.

Total cost of the freeway, including engineering and rights of way, was approximately $5,355,000. Construction was performed under six contracts.

Big Traffic Increase

Since 1948, traffic across the American River has increased about 85 percent. The sum of the average daily traffic on the three crossings (Jibboom Street, 16th Street, H Street) existing before the Elvas Freeway was completed was in excess of that on the San Francisco-Oakland Bay Bridge.

The opening of the Elvas crossing to traffic will attract appreciable volumes of traffic from both the 16th Street and H Street Bridges, providing considerable relief from the congestion and delay caused by large volumes of traffic which are presently carried by those two structures.

Motorists traveling between downtown Sacramento and the areas to the northeast will thus have a choice of two or three routes. The Elvas Freeway will, of course, attract only a portion of the traffic now using the other crossings of the American River. Relieved of much of their present congestion, the 16th Street and H Street Bridge routes will probably prove more advantageous to some motorists, depending on their destination and the amount of traffic at certain times of day.

It should be remembered that the Elvas Freeway is only one unit in a system of freeways serving the Sacramento metropolitan area, and this system is far from completion. Its efficiency in providing traffic service is limited to a considerable extent by its relationship to the existing streets and roads to which it presently connects. For example, until the entire north-south freeway which will parallel 29th and 30th Streets has been completed, the flow of traffic on the Elvas will depend on the flow of traffic on 29th and 30th Streets, which are one-way signalized arteries.

Route Designation

The Elvas Freeway will be designated as U. S. Highway 99E. It is a portion of State Highway Route 98 and replaces the former traveled route on 14th Avenue, 65th Street, 57th Street, H Street, Fair Oaks Boulevard and Fulton Avenue between Stockton Boulevard and US 40-99E east of Ben Ali. This route will be relinquished to Sacramento County and the City of Sacramento.

The new location of US 99E extends from Broadway along 29th and 30th Streets and the Elvas Freeway to US 40 at Arden Way-Swanston Road.

BORROW SITES

Continued from page 4 . . .

sands predominate on the higher areas and are, in general, of poor quality for agricultural purposes. Both sands were of high quality for structural use, having average values for the sand equivalent of 35 and 73 for the R value.

The average natural moisture in the material at the site during construction operations, between October and May, was 5 percent by weight. This amount of moisture was beneficial for loading operations and was necessary to permit operation of hauling equipment over the site due to the sandy nature of the material. This natural moisture will decrease during the coming summer months and it is expected it will become necessary to add water at the site.

Noxious Weeds and Erosion Control

To date, the only unfavorable situation encountered in the entire borrow site transaction and excavation operation is the presence of an infestation of whitehorse nettle (*Solanum elaeagnifolium*) scattered over the easterly portion of the site, amounting to about six acres of contamination. This infestation must be eradicated before any borrow can be hauled from this area of the site. After consulting with the office of the San Joaquin Agricultural Commissioner, it was determined that treatment of the infested area would be under the direct supervision of that office. The smaller areas are to be fumigated and the larger areas are to be either fumigated or eradicated by cultivation, the exact method to be determined at a later date.

It was the desire of the County Planning Commission that a cover crop be planted to prevent erosion of the sandy soil during wind storms, planting to be done upon completion of excavation of successive blocks. To comply with this plan a change order was executed with the contractor to plant a barley crop after each block had been leveled to the prescribed grades. This crop was seeded at the rate of 42 pounds per acre. Excellent stands of barley are being obtained which is gratifying to the district and is living testimony to the productivity that will be possible when this land is sold and put under irrigation.

A Creditable, Profitable Operation

After a careful consideration of the many factors involved in an operation of this magnitude, it is clear that acquisition and development of this borrow site has been of definite benefit to all parties concerned. The State has been benefited by virtue of having obtained a large economical source of excellent quality road building material. The road-user's tax dollar has again been stretched to provide additional miles of needed freeways. The community, for future generations, will be benefited by virtue of the higher productivity now possible when this 261 acres of previously unirrigable land is put under irrigation as a direct result of the excavation operations.

MEASURING PAINT THICKNESS

The use of magnetic type meters for measuring paint thickness has proven successful in producing more uniform and effective protective coating on state highway bridges.

Expressway

Riverside County Opens Two Lanes of Limited Access Project

By B. DOUGLAS POWELL, Assistant Road Commissioner

> *Riverside County is to be commended for its foresight in the development of its major traffic arteries to modern standards.*
>
> GEORGE T. McCOY
> State Highway Engineer

On April 21, 1955, work was completed on the first stage of the Arlington-Mira Loma Expressway. This is Riverside County's most ambitious federal aid secondary highway project to date, and its completion marks the end of a four-year period of planning, design and construction.

The project is notable from a county highway viewpoint in that the entire 7.36 miles of alignment is constructed on a right of way having full access control, and is of sufficient width to allow for future expansion to four-lane divided expressway standards. Also worthy of note is the fact that planning for the route was based upon providing for the needs of through traffic instead of local service and access, as has been the rule for the majority of the previous Riverside County projects.

Direct Connection Needed

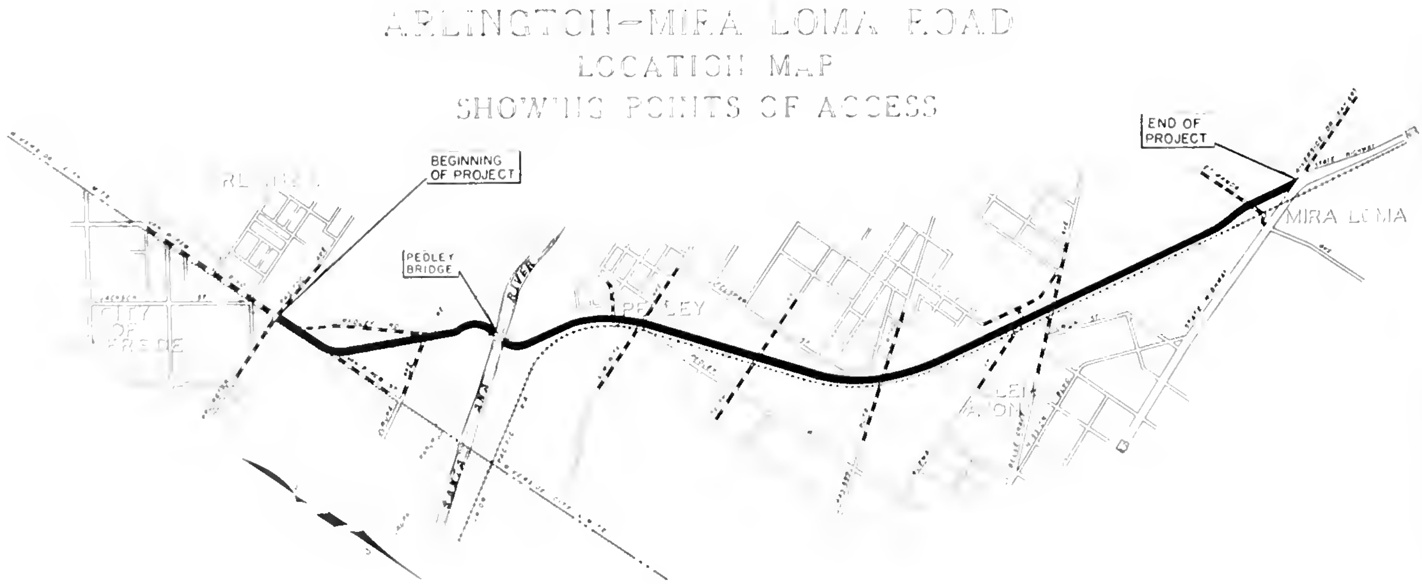
The need for a more direct connection between the rapidly developing areas south and west of Riverside and U. S. Routes 60 and 70-99 (San Bernardino Freeway) to the north had been recognized by the county for some years. It was realized that traffic destined for the metropolitan area of Los Angeles and that generated by the continuous industrial expansion of the Fontana-Ontario districts would represent a considerable percentage of the potential users of such a route.

Some initial planning for the new route was done as early as 1943 under the provisions of the State Postwar Planning Act, and some small right of way acquisition was completed at that time. The thinking at this date was primarily on the basis of a local highway to serve the various unincorporated communities north and west of Arlington, and to eliminate the narrow and dangerous underpass of the Union Pacific Railroad just north of the Santa Ana River by passing to the west of it. The Bureau of Public Roads also became interested in the project during the war years because of a proposal that consideration be given to construction of a military access road to connect between the Mira Loma Quartermaster Depot and the Camp Anza Staging area along substantially the same alignment.

Following the end of the war the unprecedented residential and industrial development of the Arlington area and southwestern Riverside made it early apparent that the through traffic to metropolitan centers around Los Angeles was suffering considerable inconvenience by having to use the relatively indirect connections via Pedley and Glen Avon. It was equally obvious that such traffic had no feasible alternate route, since the Pedley Bridge constituted the only available crossing of the Santa Ana River between Route 60 at Riverside and the state highway to the north of Corona.

Origin and Destination Surveys

As a preliminary to actual design, in 1951 the county road department made a series of origin-and-destination



Typical alignment of Arlington-Mira Loma Expressway recently completed by Riverside County under the Federal Aid Secondary Highway Program

surveys of the traffic using the route with the Pedley Bridge as a control point. Analysis of the data obtained showed that nearly 62 percent of the total traffic movement would benefit from a route selection which would be designed to serve to the north and west. An extension of the traffic figures gave a calculated ADT for 1972 of 7,560 vehicles.

Accordingly, and upon recommendation of the road commissioner, the county board of supervisors adopted a resolution in December, 1951, authorizing construction of the Arlington-Mira Loma Road, FAS Route 702, between Arlington Avenue and U. S. Route 60. It was further proposed that the route would be constructed on entirely new alignment, and would run for the greater part of its length parallel and adjacent to the tracks of the Union Pacific Railroad. This location provided a net saving of distance of 1.7 miles over the connection then in use.

Subsequent discussions of the route with the county planning commission, the State Division of Highways, and the Bureau of Public Roads served to confirm the idea that the new alignment was a natural for development as a limited-access expressway on a stage construction basis. Accordingly, and upon the recommendation of these various agencies, the board of supervisors in January of 1952 established the highway as a limited-access facility by resolution, and authorized the road commissioner to proceed with right-of-way acquisition on that basis.

Cross Traffic Problems

The proximity of the proposed road to the main line of the Union Pacific Railroad posed a problem in the potential hazards to cross traffic. It was felt that additional storage space for vehicles awaiting crossing clearance should be provided at all major intersecting roads, and that minimum right of way widths would have to be determined by this storage offset consideration. The final decision was to provide at least 120 feet of right of way at all points, and to flare to the west at major crossings so as to obtain a minimum distance of 150 feet between the center line of the tracks and the center line of the first stage of construction. This arrangement would provide for an ultimate development to four-lane divided construction with a 22-foot minimum median strip. Initial construction would be two-lane and would constitute the ultimate southbound set of lanes, thus being the farthest removed from the railroad at this time.

The plans for the project were prepared entirely by county road department staff, including all foundation investigation and materials testing work with the exception of Stabilometer testing. This design work was done in close cooperation with the District FAS Engineer and the District Materials Engineer of the San Bernardino Office of the Division of Highways. The technical assistance rendered by state highway personnel and the continuous interest they displayed in the furtherance of this project cannot be given too much credit.

No Design Problems

The final geometric layout of the project presented no unusually difficult design problems. The basic typical section consisted of a traveled way made up of two 12-foot traffic lanes with seven-foot paved shoulders adjacent. Side slopes were 4:1 or flatter in all areas except the heavy cuts. Paving consisted of three inches of plant-mixed surfacing on six inches of cement-treated base. The project was proposed as a select material job, advantage being taken of three sources of suitable base material which were expected to be encountered within the limits of the roadway prism. The thickness of the selected material blanket was varied from 6 to 14 inches dependent upon basement soil conditions. Rural expressway standards of alignment and gradient were adhered to in all respects. Intersections with eight major county roads were designed for access to the project, several of these being channelized. Frontage roads were constructed at three locations to provide access to adjoining properties.

Some delay in the advertising of the project was encountered due to difficulties in right of way negotiations. The county staff was relatively inexperienced in the acquisition of highway right of way on a controlled access basis, and the attendant problems were of considerable magnitude. The final settlements involved building relocations, consideration for well and reservoir facilities, irrigation system reconstruction, some frontage road construction, and property ownership exchanges. Severance damage was high on some parcels, and in one case the center line of construction passed through the front door of a church. Much valuable assistance was rendered by the District VIII Right of Way Agent and his staff, in suggesting possible methods of untangling these many problems and in the obtainment of the final right of way certification.

Completed in April, 1955

The contract just completed was awarded on June 30, 1954, to George Herz and Company of San Bernardino. Their bid of $333,708 was the lowest of the 13 bids received.

The work was started on July 30, 1954, and was carried on without appreciable delay to completion on April 21, 1955.

Construction engineering on the project was performed by county forces with Paul E. Stout as resident engineer. The State Division of Highways Construction Manual and practices are used on county FAS projects with as little deviation as possible. Full use is made of the construction procedures and forms of the Division of Highways, and close cooperation is maintained with the district construction department at all times. The county feels that adherence to this policy has resulted in a much improved knowledge of the changes and current developments in the construction industry by its staff, and welcomes the opportunity it provides to draw on the wide experience of the State in such matters.

The major item in the contract was roadway excavation, the total earthwork being in excess of 210,000 cubic yards. Rather long hauls were necessary, due principally to the wide variation in basement soil and to the placement of the select material blanket course. Total overhaul was approximately 3,700,000 station yards.

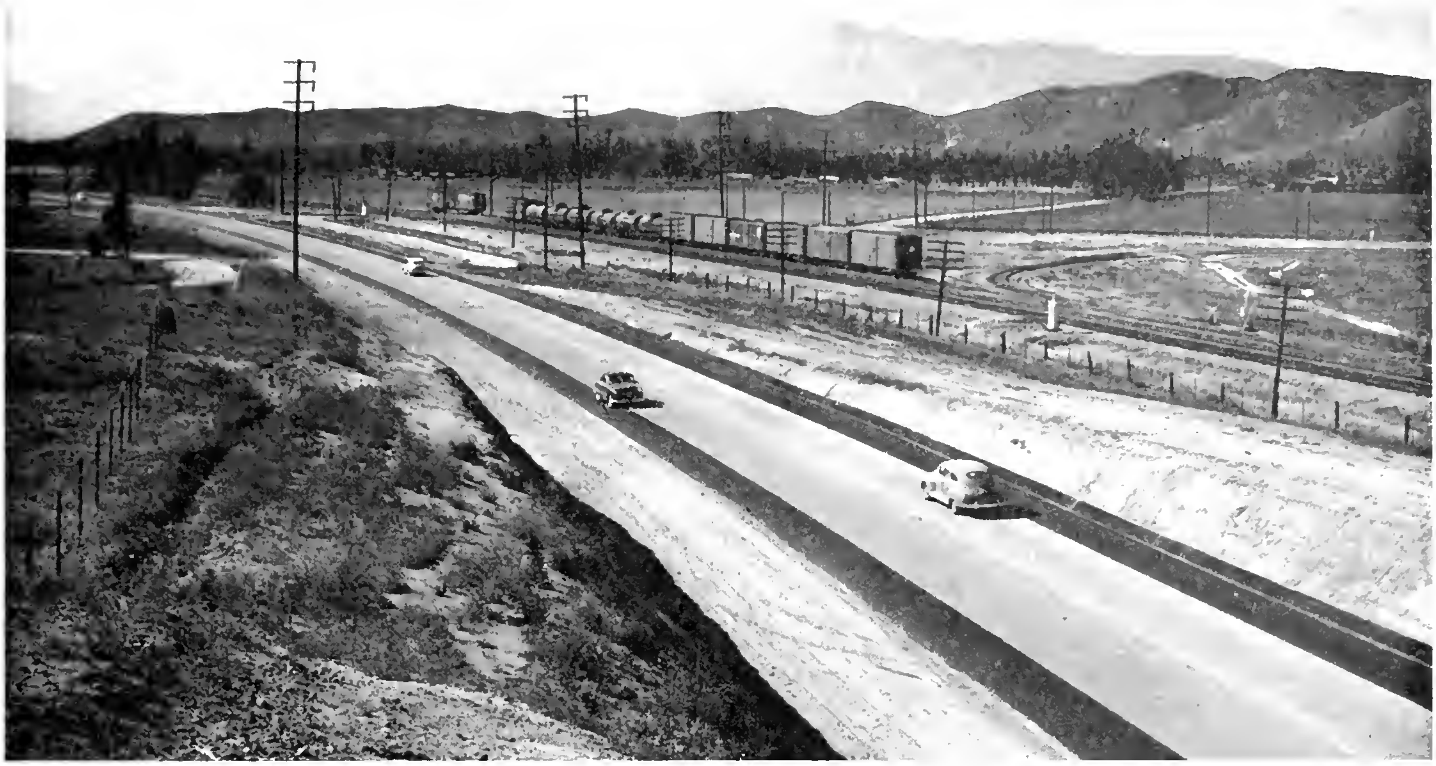
Box Culverts Required

Exclusive of the Santa Ana River, the alignment was crossed by four major drainage channels which required the construction of multiple barrel concrete box culverts. Minor waterways were passed under the road with corrugated metal culverts ranging in size from 78 inches to 24 inches. Due to the proximity of the Union Pacific Railroad, drainage structure requirements and locations were largely controlled by railway installations. Use was made of the existing Pedley Bridge across the Santa Ana River without modification except for resurfacing and the installation of new approach guard railing. Development of the route to full four-lane status will require the construction of a parallel crossing at this point.

The cement treatment of the top six inches of the select base material was performed by Gardner Roadmixers, Inc., of Redlands. This organization has pioneered in the development of specialized types of equipment for this work, some of which were used on the project. Of special interest was a subgrading machine constructed on a standard motor grader chassis and capable of shaping a full 23 feet of the roadbed at a single pass. Also used by the subcontractor during the base operations was a segmented-wheel compacting roller for the compaction of the cement-treatment. Both of these units produced exceptional results and materially speeded up this phase of the construction. Some 110,000 square yards of cement-treated base were prepared and spread, using approximately 3,400 barrels of portland cement.

New Asphalt Plant

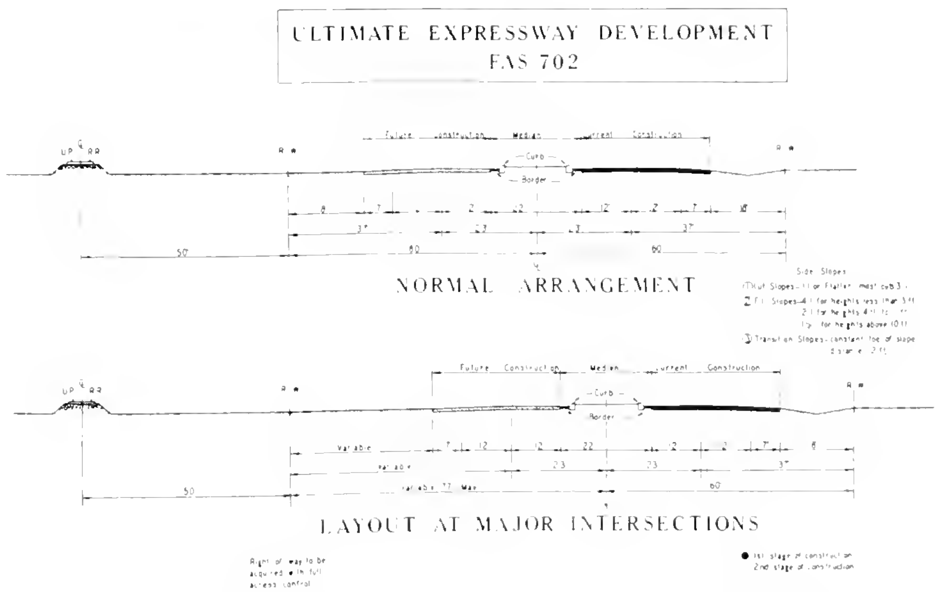
The plant-mixed surfacing for the project was produced and mixed in the contractor's new asphalt plant located just west of the Mira Loma Quartermaster Depot about one mile from the north end of the project. This new plant incorporated the latest developments in the field and is one of the finest in the entire valley area. The high production rate possible with this plant resulted in the placement of 1,540 tons of plant-mixed surfacing in one day of operation on this project. A considerable portion of the paving for the project was spread by the use of a new model pneumatic-tired paving machine, an operation which was viewed with considerable interest by state and local road officials and valley area contractors. The machine performed very well, and checks on the finished surface smoothness made by the Headquarters Construction Department Roughometer showed a roughness coefficient of only 8.2



Riverside County's limited access highway between Arlington and Mira Loma built under Federal Aid Secondary Program. This seven-mile project has only seven intersections and will be later converted to a four-lane divided expressway by the addition of another two-lane highway between existing road and railroad.

inches per mile. Approximately 31,000 tons of plant-mixed surfacing was placed under this contract.

Seal coating of the traffic lanes on this road was done by the use of another innovation in road-building equipment. This machine was a self-propelled chip spreading device furnished and operated by Contractors Specialty Company, subcontractors for this phase of the work. Use of this device also attracted a considerable audience from the district construction office and from local contractors. The performance of the machine can best be demonstrated by the fact that the seal-coating of the entire 7.36 miles of the project was performed in nine working hours. The operation of the unit is such that joints are required only very infrequently, one section being sealed continuously for a distance of 5,000 feet without the necessity of stopping to make a joint. Three rollers were required in order to keep up with the pace set by the chip spreading machine.



Miscellaneous Items

Only the traffic lanes of the road were given a medium-fine chip seal coat, all other areas, including frontage roads were treated with a penetration-type seal coat.

Miscellaneous items of construction performed on this contract included the installation of eight and one-half miles of property fence to protect the access, and the demolition of almost 5,000 linear feet of abandoned irrigation facilities.

Additional and extra work on this project resulted in a final cost of $342,149.57 exclusive of preliminary engineering and right of way. This figure represents a cost of $46,500.34 per mile for the completed expressway development.

Traffic counts taken in the brief period since the opening of the new

. . . Continued on page 26

Henderson New Deputy Director of Public Works

Appointment of A. H. Henderson as Deputy Director of the State Department of Public Works was announced on April 21st by Frank B. Durkee, Director of Public Works. The appointment took effect April 22d. Henderson was appointed, Durkee stated, from a civil service list after passing a civil service examination for the position.

Henderson has been in the state service for 37 years; 29 of these years, Durkee stated, were in the Department of Public Works, in different positions in the Division of Highways, Division of Architecture, and in the director's office. Previously, Henderson was assistant director and deputy director of the department for six years under the late C. H. Purcell. He is being promoted from his present position of departmental disbursing officer.

The former deputy director of the Department of Public Works, Russell S. Munro, recently left this position to accept the appointment of Governor Goodwin J. Knight as director of the new Alcoholic Beverage Control Department.

Henderson was succeeded as disbursing officer by Leo S. Fahy.

APPRECIATES HIGHWAYS

California Highways and Public Works

Dear Sirs: Please note my change of address from 435 North Catalina Street, Pasadena 4 to 1547 North Durfee Avenue, El Monte.

I hope to continue to receive your wonderful magazine. It has helped my driving habits and enjoyment of my native state. It also gives me good foundation for explanation to out-of-state people where our gasoline tax goes and the fine highways we have. Your department has made California a much prettier state and much safety has been added to our driving through your efforts.

Thank you,

George H. Brown

BAKERSFIELD IMPROVES A MAJOR CITY STREET

By J. HOLFELDER, Bakersfield Director of Public Works

Bakersfield recently completed the improvement of Union Avenue between 21st Street and Nile Street. The project is a typical example of the expenditure of State Highway Users Tax Funds to improve a major city street in this city.

Although a relatively small project (0.28 mile) the job included more work items than the average larger project. The operations included:

1. Widening the existing pavement with four-inch plant mix surfacing.
2. Resurfacing existing pavement with one-inch of plant-mixed surfacing.
3. Removing and reconstructing curbs, gutters, sidewalks, driveways, and constructing curb dividers.
4. Constructing storm drains with inlet junction structures.
5. Installing traffic signals and mercury vapor street lighting including traffic-actuated signals at Sumner Street (State Rt. 58) and synchronizing these signals with the State's signals at 21st Street and Golden State Avenue, U. S. 99, one block away.
6. Installing automatic flasher beacon at the Southern Pacific Railroad main-line crossing.
7. Widening and extending the box culvert at the East Side Canal.

The total cost of the project was $127,650 distributed as follows:

City funds	$8,937
⅝¢ gas tax funds	105,385
State Highway Fund	9,957
Southern Pacific Railroad Fund	3,371
Total	$127,650

The plans and specifications were prepared by the Engineering Division of the City of Bakersfield. Advice on the plan preparation and construction inspection was furnished by the Division of Highways together with all field and laboratory testing required. Acknowledgment is made of the Division of Highway's fine spirit of cooperation without which the project's successful progress would have been doubtful.

Looking south across the intersection of Union Avenue with Twenty-fourth Street

Looking north along Union Avenue in Bakersfield from above intersection with US 99, which curves off to left. Evening peak hour traffic.

Montgomery Freeway

Completed to Mexican Border

By E. E. WALLACE, District Engineer

By Assembly Concurrent Resolution No. 16, adopted on March 16, 1949, the portion of US 101 beginning at 13th Street in National City and extending to the international boundary at Tijuana was designated as the Montgomery Freeway. The entire 11-mile section of this freeway is now completed and a dedication ceremony is contemplated on June 17, 1955.

The original routing of US 101 extended through the business districts of National City and Chula Vista along National Avenue, thence via a two-lane highway with substandard width and alignment to the border connection south of San Ysidro. This resulted in traffic congestion and a very high accident rate.

The relocation of U. S. 101 began in June, 1950, when the first unit of the freeway was started between Seventh Street and 16th Street in National City and completed at a cost of $122,624.

The second unit extended from 14th Street in National City to H Street in Chula Vista, over a length of three miles. This section was completed in September, 1951, at a cost of $1,410,085.

Unit number three involved a separate contract for two grade separations, one at H Street and one at Main Street. Work was completed in April, 1951, at a cost of $147,973.

The fourth project extended from G Street in Chula Vista to Elm Avenue in Palm City, a length of 3.8 miles, and was completed in April, 1952, at a cost of $1,270,699.

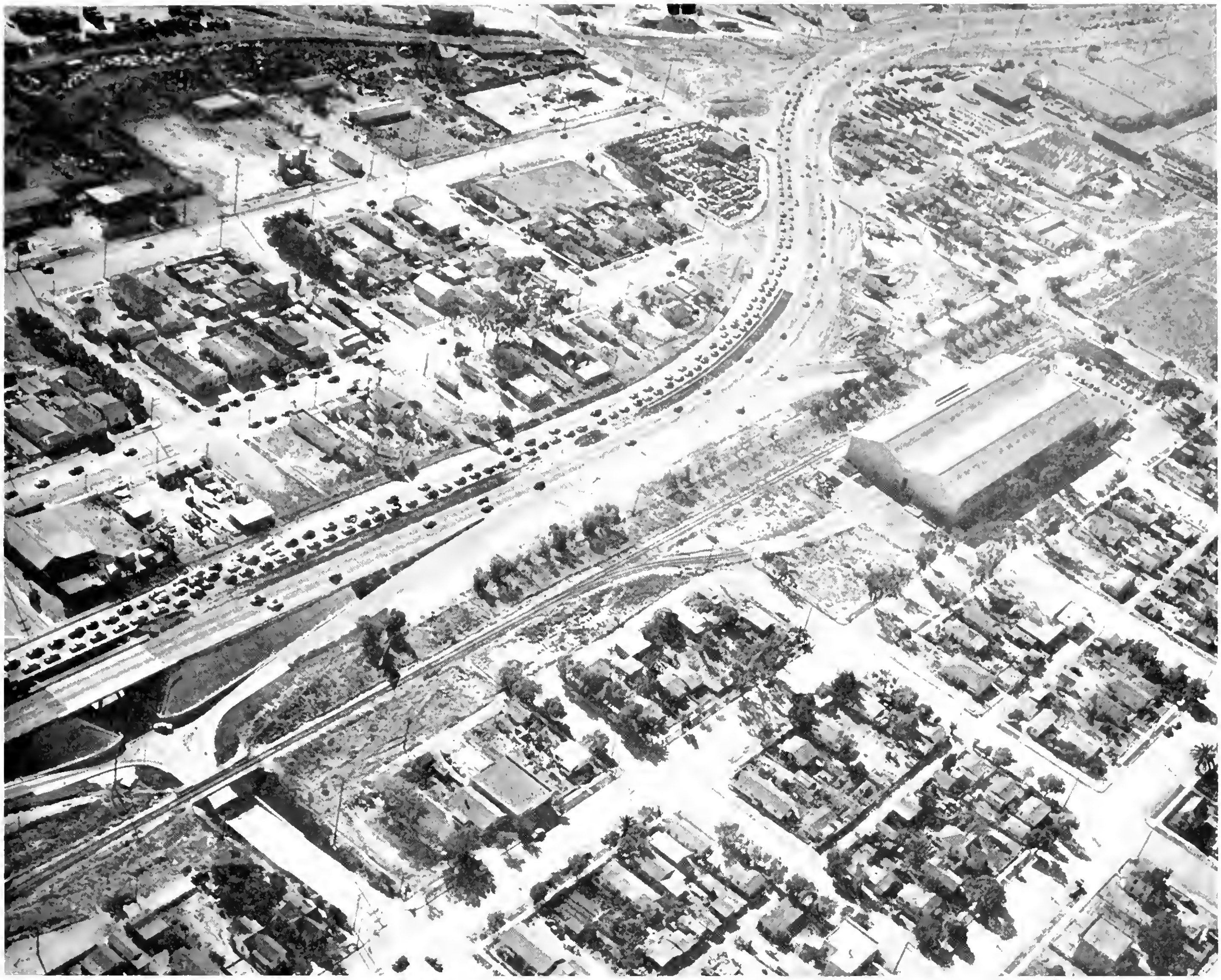
Unit number five extended the construction from Palm Avenue in Palm City to one-half mile south of Nestor, a length of 1.1 miles. The project was completed on June 23, 1953, at a cost of $332,135.

Final Major Unit

The sixth unit, from one-half mile south of Nestor to the international border south of San Ysidro, was completed in April, 1955, and covered a length of 3.9 miles at a total construction cost of $1,198,829.

The seventh, and final major unit, consisted of construction of a complete interchange at L Street in the City of Chula Vista, replacing a temporary grade intersection which was controlled with signals. The cost of this project was $187,805.

LEFT—International border station at Tijuana, looking north on freeway. RIGHT—South end of freeway: San Ysidro in U. S. on left; Tijuana in Mexico at top.



Traffic at Eighteenth Street Undercrossing. Looking northwest.

Several minor contracts for highway lighting, traffic striping, revision of signals and other minor improvements amounted to $132,878.

Summarizing the complete project from Eighth and Harbor Streets in National City to the international border, the total cost for the 11.1 miles was as follows:

Construction	$4,803,000
Right of way	2,000,000
Grand total	$6,803,000

Twenty-five Structures

Twenty-five structures were involved, with traffic interchanges at nine different locations; railroad separations at three locations; bridges across major drainage channels at four locations; and one pedestrian underpass.

Because of insufficient financing it was necessary to place temporary grade intersections at Dawson Street, at Dairy Mart Road and at Palomar Street. These will be replaced with separation structures in the future as they can be financed. The cost of these future interchanges will be about $370,000.

With the completion of the three separations mentioned there will be provided a full freeway consisting of a four-lane roadway with wide center division, ample shoulders, and elimination of all intersecting traffic and complete control of access from 13th Street in National City to the connection with San Ysidro Boulevard near the border.

Heavy Traffic

The Montgomery Freeway is already carrying average daily traffic of 23,500 vehicles throughout its length, with maximum traffic as high as 32,000 vehicles per day.

US 101 to the border carries a large volume of tourist traffic destined for a visit to Old Mexico through the Tijuana gate. Traffic has been increasing rapidly and this border crossing ranks first in the Nation as a border port of entry.

The Collector of Customs reports that vehicular traffic entering the United States through the border gate at San Ysidro in 1954 was 3,611,882,

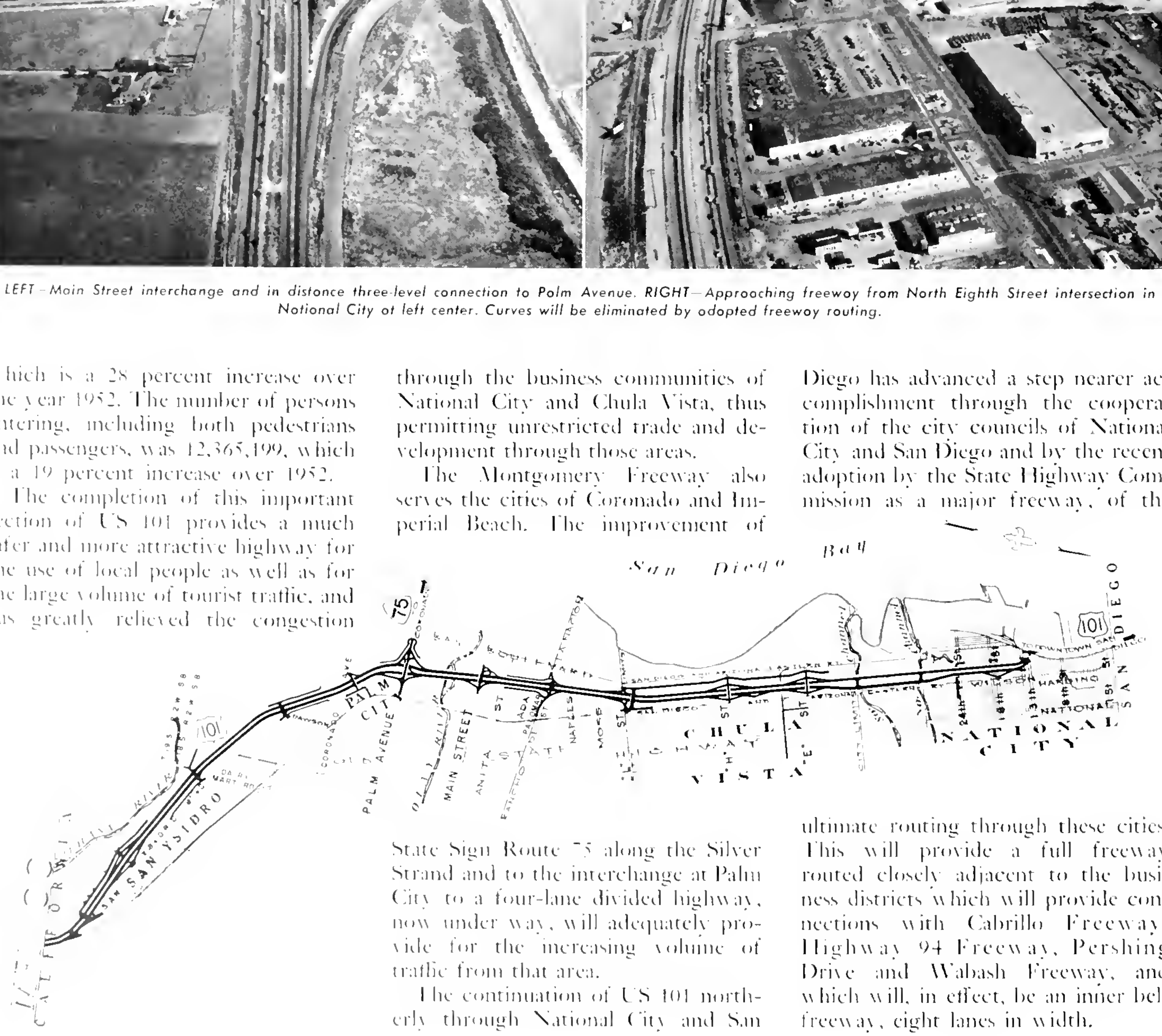
LEFT—Main Street interchange and in distance three-level connection to Palm Avenue. RIGHT—Approaching freeway from North Eighth Street intersection in National City at left center. Curves will be eliminated by adopted freeway routing.

which is a 28 percent increase over the year 1952. The number of persons entering, including both pedestrians and passengers, was 12,365,199, which is a 19 percent increase over 1952.

The completion of this important section of US 101 provides a much safer and more attractive highway for the use of local people as well as for the large volume of tourist traffic, and has greatly relieved the congestion through the business communities of National City and Chula Vista, thus permitting unrestricted trade and development through those areas.

The Montgomery Freeway also serves the cities of Coronado and Imperial Beach. The improvement of State Sign Route 75 along the Silver Strand and to the interchange at Palm City to a four-lane divided highway, now under way, will adequately provide for the increasing volume of traffic from that area.

The continuation of US 101 northerly through National City and San Diego has advanced a step nearer accomplishment through the cooperation of the city councils of National City and San Diego and by the recent adoption by the State Highway Commission as a major freeway, of the ultimate routing through these cities. This will provide a full freeway routed closely adjacent to the business districts which will provide connections with Cabrillo Freeway, Highway 94 Freeway, Pershing Drive and Wabash Freeway, and which will, in effect, be an inner belt freeway, eight lanes in width.



Traffic Line Markers

Raised Buttons Give Night Visibility in Wet Weather

By H. A. ROONEY, Associate Chemical Testing Engineer, and
J. A. CECHETINI, Assistant Physical Testing Engineer

This article describes a research project performed by Materials and Research Department as part of a study in seeking to make the visibility of traffic lane marking as effective at night during heavy rainfall as the visibility of white traffic paint striping is effective in clear or foggy weather.

Type IV white traffic paint, currently used for traffic striping by the Division of Highways, has good wearing qualities and the striping exhibits excellent day and night visibility in clear or foggy weather. However, at night during heavy rainfall the ability of traffic paint striping to delineate traffic lanes is reduced to almost zero. A wet traffic line, even when containing embedded glass spheres, will not reflect light to the driver of an approaching vehicle as the water diffuses the light and the white traffic line appears to be engulfed in the darkness of the pavement.

Raised Surfaces

It is well known that properly shaped white surfaces positioned at a level of only a fraction of an inch above the highway surface will reflect light better under all weather conditions than a white painted line on the highway surface. These reflectant surfaces must be slanted or curved and oriented toward the incident light in order to be most effective. Traffic line markers based on this principle have been employed to delineate traffic lines but due to the materials used to fabricate the marker and to the means employed in attaching the marker to the highway surface, the marker soon became dislodged or broken under the repeated impact of traffic.

The Chemical Section of this department, under the direction of E. D. Botts, undertook a research program to develop a raised traffic marker and a means for permanently attaching the marker to the highway surface. Previous extensive work done by Botts and Rooney with epoxy resins showed that these resins used in conjunction with thiokol polysulfide rubbers and fillers formed a remarkable adheseive or cementing agent which would bond tenaciously to concrete. Concrete slabs were cemented together with this adhesive formulation and subsequently subjected to vertical shearing stresses parallel to the resin bond.

In all tests the concrete failed when its limit in shear was exceeded and no failure was noted in the resin bond. In other tests broken concrete beams were cemented together with the adhesive and after proper curing were subjected to flexual stresses. In every test the beams broke in new places, the adhesive bond remaining intact. Limited experimentation has shown good adhesion to asphaltic concrete provided the aggregate of the concrete is exposed and free of oil.

Button-type Markers

The first traffic markers developed by the Chemical Section were about four inches in diameter, convex in shape with a $\frac{3}{4}$-inch crown as shown in Figure 1 and referred to as the "button" type in this report. They were composed of an epoxy-thiokol binder with titanium dioxide as a white pigment and glass spheres as the aggregate. The impact strength of these button markers was far in excess of that which would be required on a road surface; several full blows of a large sledge hammer being required to disintegrate the marker. The button traffic marker is installed by cementing it to the portland cement or asphaltic concrete pavement surface with the epoxy-thiokol adhesive.

The most satisfactory adhesion will be obtained if the area of contact with the pavement surface is first cleaned by sand blasting in order to expose clean concrete and to remove any oil film. The molecular crosslinking or setting action of the epoxy resin is caused by the addition of an organic amine curing agent which is added just prior to the use of the adhesive. The setting time of the adhesive is dependent upon temperature; a temperature of 45° F. or below will stop the setting action while a temperature of 80° F. or above will cause the adhesive to set sufficiently to bear traffic in about $2\frac{1}{2}$ hours.

Setting Time Speeded Up

In critical areas where traffic lanes cannot be closed for longer than 15 minutes or when air temperatures are less than 80° F., the setting time of the adhesive attaching the raised traffic

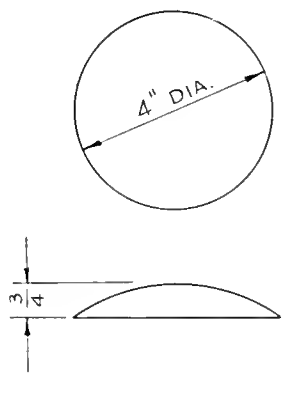


FIG. I

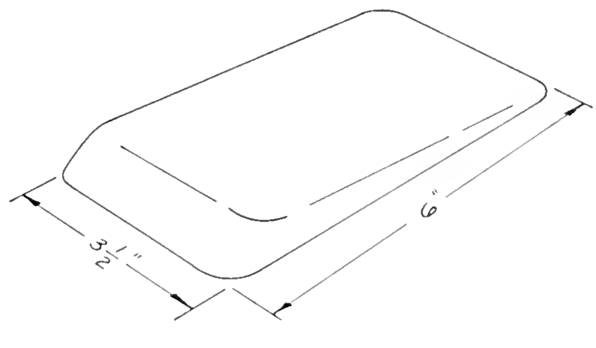


FIG. II

FIG. III

marker to the pavement may be speeded by the application of heat. Applying a butane torch to a small oven inverted over the marker for about three minutes and allowing the marker to remain in the heated oven for 15 minutes will generally induce a complete set so the marker will be capable of bearing traffic.

The Materials and Research Department has made four major and one minor experimental installations of the button type epoxy traffic markers in the last nine months. Markers were installed on a crosswalk over four lanes of concrete pavement on the El Camino Real at Palo Alto in September, 1954. Those markers are hit by traffic more than 20,000 times per day and to date none of the markers have been dislodged or broken. The markers in this installation are subject to impact of traffic which is many times more severe than would be obtained on markers used to delineate traffic lanes. Similar satisfactory results have been obtained at all other installations such as the portion of the San Francisco-Oakland Bay Bridge where the button markers where installed 24 feet apart on the white tile traffic line in September of 1954, the markers installed on the North Sacramento Freeway and the approaches to and over the H Street Bridge at Sacramento where markers were also placed 24 feet apart and at the centers of the unpainted portions of the broken white traffic lines. A small number of "button" markers was placed on the Santa Ana Freeway on the southbound lane, just north of Slauson Avenue intersection in Los Angeles.

High Visibility

The intent of these installations was that the raised marker would be supplementary to the white lines for wet weather visibility. During the heavy rains of the past winter it was conclusively shown that the raised white markers were highly visible both day and night, whereas the white painted lines were difficult to see.

While the epoxy-thiokol traffic button marker possesses excellent structural qualities, it also presents manufacturing difficulties, and high cost of materials. Experiments were conducted by L. P. Kovanda, Associate Materials and Research Engineer of the Concrete Section of this department, to develop a material which would be suitable for traffic markers, reduce the costs and produce of highly reflectant surface. The material selected as possibly being the best for the manufacture of traffic markers consists of white portland cement, glass spheres, aggregate and titanium dioxide as a white pigment. Button traffic markers of the shape and size as shown in Figure No. 1 were fabricated from this material and allowed

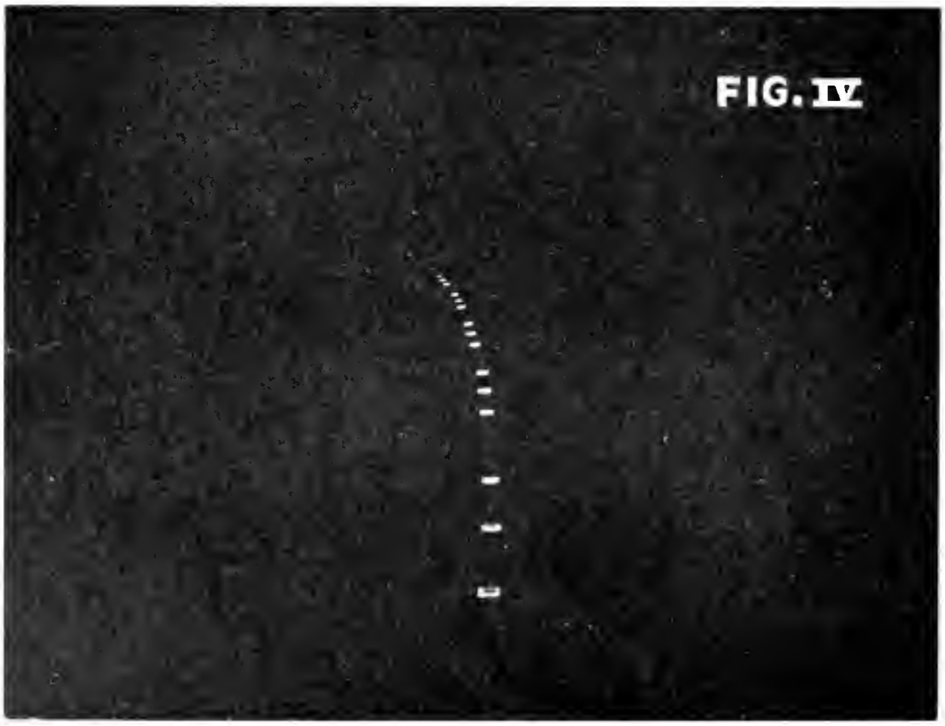


FIG. IV

to harden in a moist atmosphere for seven days. Compressive strength tests show the material to attain a strength of 2,800 psi at seven days. The exposed surface of the button markers was treated with hydrochloric acid in order to expose the glass spheres embedded in the body of the markers and to make the surface highly reflectant. Although this marker has the brittleness characteristic of most portland cement products, tests on an installation of this marker on Fair Oaks Boulevard east of the H Street Bridge at Sacramento have shown after seven months that it will withstand the impact of a large volume of traffic when properly cemented to an asphaltic pavement. The resistance to impact and dislodgment of this marker is no doubt due to the ability of the epoxy-thiokol adhesive to firmly attach the marker to the pavement and at the same time reinforcement it provided the adhesive is applied to the marker so that no voids exist in the area of contact with the pavement.

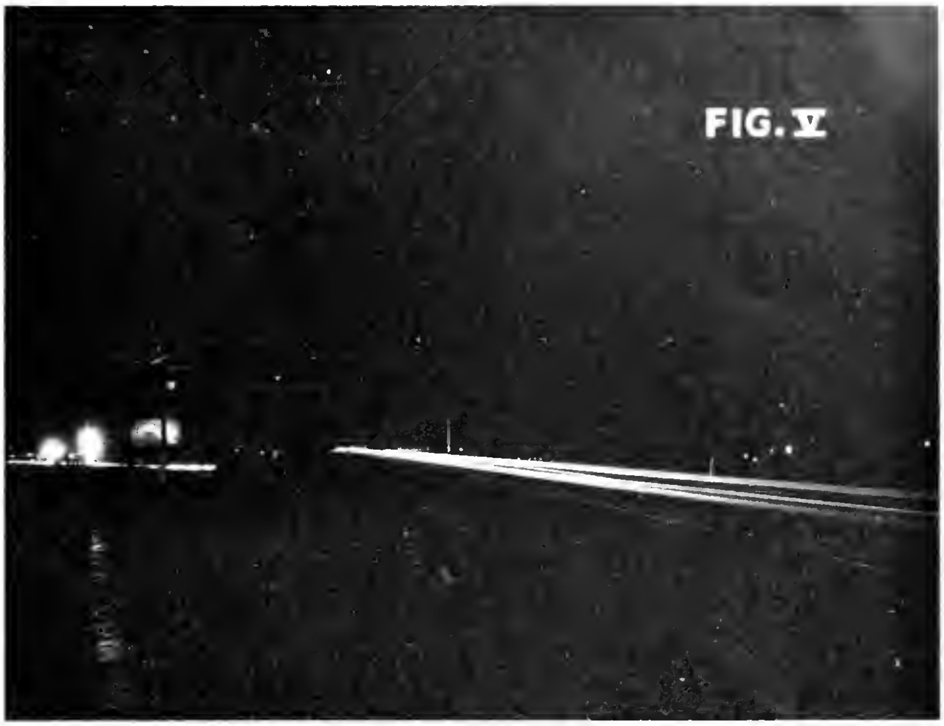


FIG. V

Used on Elvas Freeway

James A. Cechetini of the Concrete Section designed a new shape in concrete traffic markers as shown in Figure II. This marker is wedge-shaped, $3\frac{1}{2}$ inches wide, six inches long and sloping from a height of one-eighth inch in the front to one-half inch in the rear. The Materials and Research Department made an experimental installation of these reflectant concrete "wedge" markers on the eastbound concrete lanes of the Elvas Freeway at Sacramento. On this test section, which is about $2\frac{1}{2}$ miles long, only the concrete wedge marker will be used to delineate the traffic line.

Spacing of the concrete wedge markers varies with the alignment of the road, the markers being installed at 6, 12 and 24 feet apart. All concrete markers were cemented to the concrete pavement with the epoxy-thiokol adhesive. The object of this test section is to determine the service life of the concrete wedge markers, their reflectance under all weather conditions and the cost of their installation and maintenance compared to the cost and maintenance of a painted traffic line. The wedge markers of this installation were photographed at night under headlight illumination during clear and rainy weather as shown in Figures III and IV, respectively. Figure V shows the poor visibility of a painted line as photographed during the same rainstorm when the photograph of the wedges shown in Figure IV was taken.

Applications for Patents Filed

No conclusion can be drawn as to the feasibility of adopting reflectant markers as a traffic stripe until the experimental test section has seen service for at least two years. Although technical data does not indicate that the epoxy-thiokol adhesive will lose its adhesive properties over a period of time, only exposure to actual road service conditions will verify this.

TOLL COLLECTORS PRAISED

ALBANY, CALIFORNIA

CAPTAIN M. L. SILVEY
Toll Plaza Administration Bldg.
San Francisco-Oakland Bay Bridge

DEAR CAPTAIN SILVEY: This message comes to you concerning the courtesy of the men who collect tolls at the San Francisco-Oakland Bay Bridge, and has been waiting to be written for some time.

Having come to the Bay area about five years ago, I was very pleasantly impressed with the almost never-failing "thank you" spoken by these men, and wondered how they could keep it up so nicely moment after moment! I have since become a regular daily commuter over this bridge, and as no doubt happens in many cases, too often seem unaware of hearing it, although frequently conscious of a time when it isn't said.

One day within the past few weeks, on a particularly trying morning from a personal standpoint, I came through as usual—absorbed in private grievances—when the collector at that time spoke a most pleasant "thank you," accompanied by a smile. This quickly changed the whole atmosphere of the morning, and I found myself smiling also, being grateful for this impersonal courtesy. I am sure this cannot be a unique experience just for one person, and realizing that this spoken word may have an influence far beyond its immediate expression, I sincerely hope that the pressure of those jobs will never eliminate this rare public service. My sincerest "thank you" to those patient collectors of tolls!

Sincerely yours,

MRS. F. C. GOERGES

In Memoriam

MICHAEL D. POBOR

On April 30th Michael Pobor, Junior Civil Engineer for the Materials and Research Department of the State Division of Highways, met death when the car he was driving collided with a train in Sacramento.

Born in Miama, Arizona, on November 7, 1919, Pobor's life was eventful and varied. He was a capable amateur boxer, parachute instructor, mathematician, and inventor. He spoke six languages, including Slavonian, Spanish, Italian, French, and Russian.

Mike was employed by the Division of Water Resources in 1950, by the Bridge Department from 1951 to 1954, and by the Materials and Research Department since June, 1954.

He is survived by a widow and one son.

EXPRESSWAY

Continued from page 17 . . .

route have demonstrated that the traveling public has taken immediate advantage of the time and saving benefit it represents. The average daily traffic for the first two months was 6,250 vehicles, which makes the Arlington-Mira Loma Road the heaviest traveled rural highway in the entire Riverside County system. It is expected that the volume will continue to increase as more and more people become familiar with the route. It is hoped that an origin and destination survey can be made in the near future to establish the use pattern and thus determine if the original design assumptions were correct.

Since 1946 the county has been working in close cooperation with the State Division of Highways and the Bureau of Public Roads in an effort to keep the county's FAS system abreast of the expanding Southern California economy. In this period some 15 projects have now been completed, comprising five bridges and 47.6 miles of road at a total expenditure in excess of $2,130,000.

The county road department feels that one of the most valuable aspects of the federal aid secondary highway program is the opportunity it provides for the county staff to work with, and become familiar with, the design and construction practices of the State Division of Highways. The training, methods, and engineering know-how acquired by the county staffs during the planning and construction of these projects has been integrated into their own road building efforts and is reflected in the increased standards of such work in the years since the program's inception.

Employees Receive Twenty-five-year Awards

Employees of the Division of Highways who became eligible for 25-year awards between December 31, 1953, and May 31, 1955, are:

Name	Total service Yrs.	Mos.	Days	Name	Total service Yrs.	Mos.	Days
ELIGIBLE ON DECEMBER 31, 1953				**ELIGIBLE ON MAY 31, 1955**			
Rodriquez, Peter V	25	0	11	**District I**			
ELIGIBLE ON JANUARY 31, 1955				McMahon, William G.	25	0	28
Grohman, George J.	25	0	19	**District III**			
ELIGIBLE ON APRIL 30, 1955				Nicholson, R. I.	25	0	6
District III				Sherwood, Harold F.	25	0	16
Cormier, Isaac D.	25	0	7	**District VI**			
District IV				Harbey, George A.	25	0	23
Allendale, Ernest H.	25	0	29	Parker, Robert B.	25	0	5
Coles, Wilfred W	25	0	20	**District VII**			
District VI				Lamb, Giles Harvey	25	0	9
Porter, Harvey W.	25	0	5	Preston, Allen	25	0	5
District VII				**District IX**			
McBroom, E. H.	25	0	19	Baxter, Frank E.	25	0	6
District VIII				**District X**			
Barnes, Harold M.	25	0	10	Lucas, Frank L.	25	0	19
Lucas, Pearl F.	25	0	27	Thomas, Everett R.	25	0	23
District X				**District XI**			
Vergara, Dolph J.	25	0	9	Moore, Burton F.	25	0	24
Young, Lester W	25	0	10	Reinius, Carl O.	25	0	22
District XI				**Central Office**			
Webler, Arthur D.	25	0	17	Carr, Alden W.	25	0	19
Shop 11				Small, M. J.	25	0	26
Rosenbaum, Charlie H.	25	0	5	Warmby, Edwin W.	25	0	5
Department of Public Works, Directors Office				**Bridge Dept.**			
Klauser, Helen P.	25	0	12	Green, John W	25	0	5
				Bay Bridge			
				Bunce, Ivan	25	0	6
				Shop 7			
				Mayer, Paul L.	25	0	13

Employees of the Division of Architecture who became eligible for 25-year awards between September 1, 1954, and May 31, 1955, are:

Name	Birth date	Name	Birth date
ELIGIBLE ON SEPTEMBER 3, 1954		**ELIGIBLE ON MAY 15, 1955**	
Estimating Section		**Structural Section**	
Booth, Richard L.	3- 8-12	Brownfield, Allen H	11- 2-04
ELIGIBLE ON FEBRUARY 6, 1955		**ELIGIBLE ON MAY 20, 1955**	
Drafting Section		**Structural Section**	
Ellis, Charles L.	9-27-98	Muller, Herman C.	5-16-05
ELIGIBLE ON APRIL 6, 1955			
Civil Section			
White, Azmon D.	6-19-96		

New Expressway

Paso Robles-San Miguel Project Rated as Unusual in Design

By E. J. L. PETERSON, District Engineer

A 6.5-MILE SECTION of expressway in San Luis Obispo County, a portion of US 101, following the Salinas River along the foothills of the Santa Lucia Mountain Range between Paso Robles and San Miguel, has been completed and opened to public traffic.

Mission San Miguel Archangel, situated in the Town of San Miguel, marks the northerly terminus of the project. This mission, which was founded in 1797, is one of the string which marks the path of the Padres through California. The southerly terminus is at the City of El Paso de Robles, so named by the Mission Padres because of the beautiful oaks.

In the design of the new facility the existing highway was incorporated into the construction of the northbound lanes between two miles south of San Miguel and San Miguel, and between Paso Robles and one mile north. The remainder of the facility is on new alignment, slightly west of the existing road. The mile-long segment of the northbound lane just north of Paso Robles was designed with a plant-mixed surfacing and will become a ramp when the freeway through Paso Robles is constructed. With this exception, the typical section provides traffic lanes surfaced with portland cement concrete, with opposing lanes being separated by a median generally 46 feet wide.

Design Was Unusual

The design of this section of highway was unusual in that photogrammetric contour maps (contour maps made from aerial photos) and contour grading plans were used to prepare the contract plans. Each one of these features has been employed to a limited extent in highway design, but this is one of the first projects in which they were combined. Considerable survey and design time was saved by the employment of this procedure as excavation and embankment quantities for the contract plans were calculated from contour maps with five-foot intervals. A comparison of the total quantity of roadway excavation obtained by the standard methods, that is average and area, and by the contour grading plans, disclosed a difference of only 0.11 percent which is an unusual degree of accuracy and was due to several favorable factors, primarily the rolling nature of the terrain with its sparse growth of brush and trees made it favorable to the contour method and the accuracy was a result of compensating errors rather than consistent accuracy.

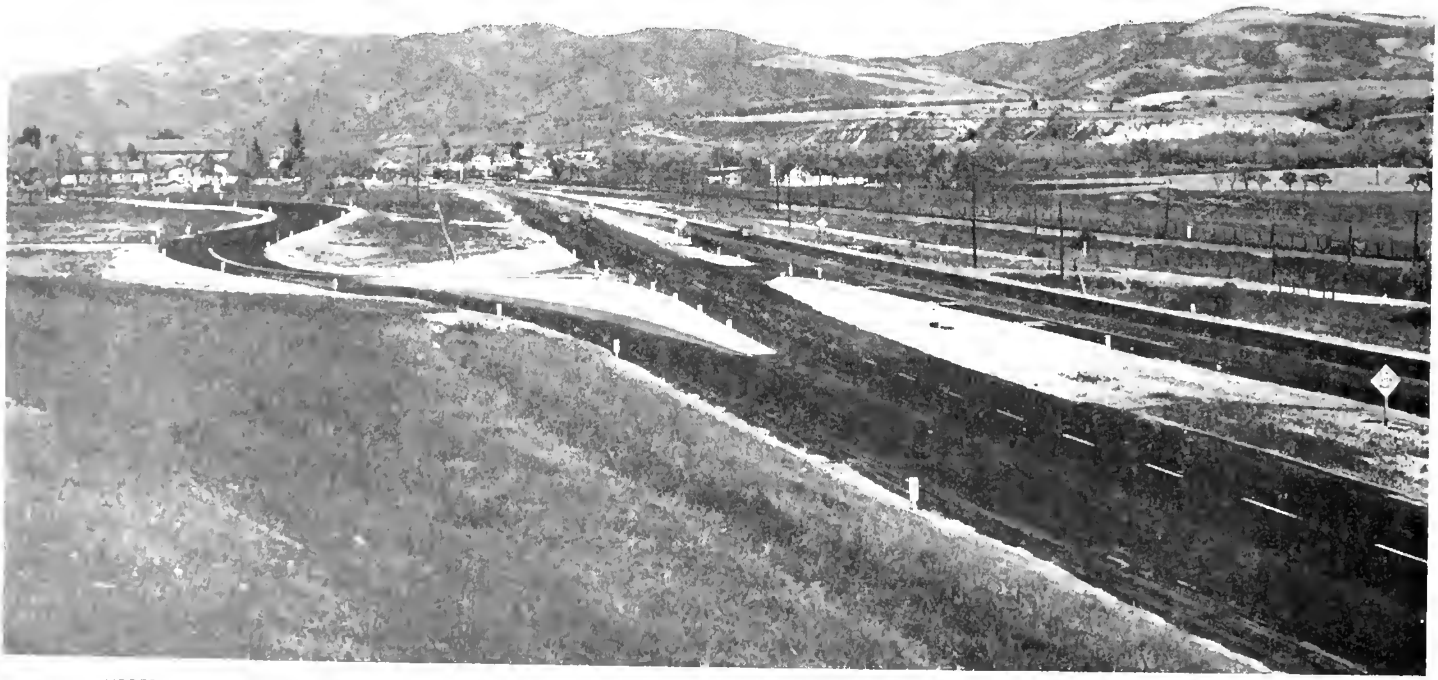
Favorable Results Obtained

In view of the favorable results obtained with the contour method for the grading quantities on this project, it has since been employed very successfully in the design and construction of other projects.

The construction of the project, which included approximately a million yards of roadway excavation and the placing of 35,000 cubic yards of portland cement concrete pavement, was performed under two contracts. The first contract included the major portion of the grading, the construction of drainage structures and the construction of a reinforced concrete slab bridge across San Marcos Creek and was awarded to Madonna Construction Company of San Luis Obispo on May 20, 1953. Work began June 1, 1953, and was completed March 12, 1954, at a cost of $638,362.

The second contract included grading, paving and other work required to complete the project which was awarded to the firm of Gordon H.

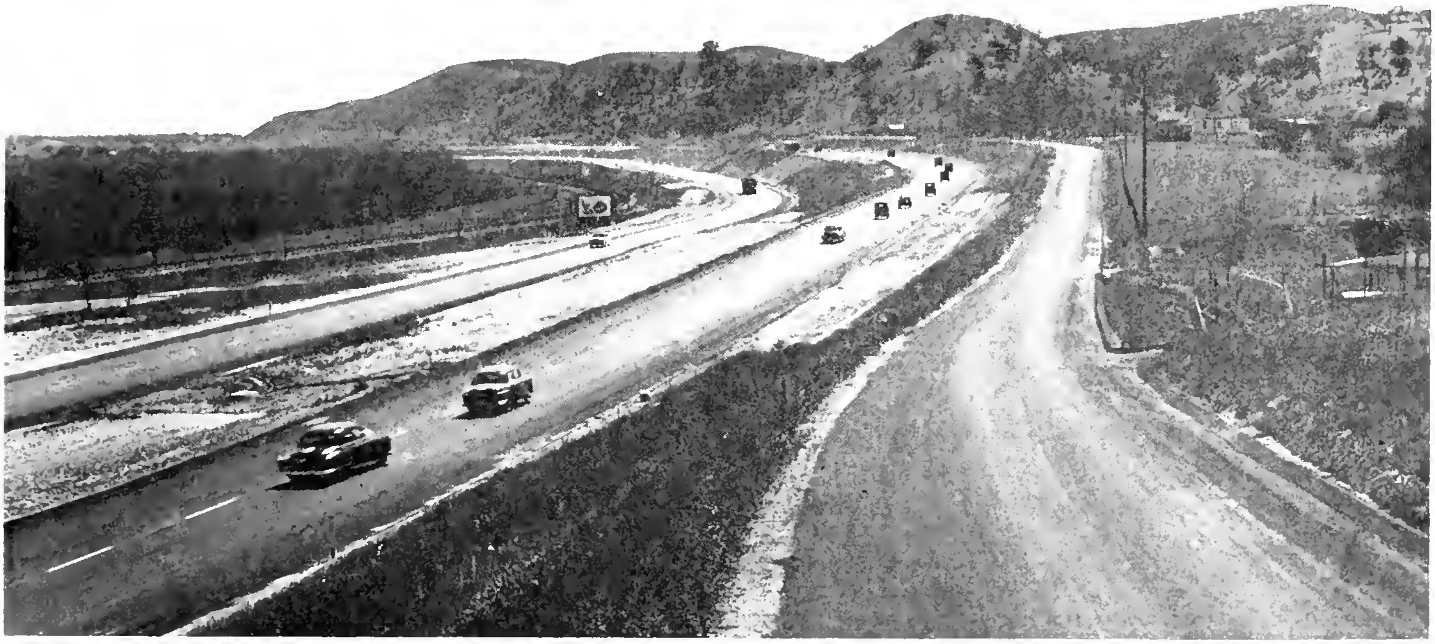
View of expressway near San Marcos Creek, looking northerly



UPPER View of completed freeway looking northerly toward the Santa Lucia Mountains near Paso Robles. LOWER Northerly terminous of expressway at San Miguel with mission at left.

Ball and San Ramon Valley Land Company of Berkeley, California. Work began March 31, 1954, and was completed December 31, 1954, at a cost of $1,026,154.

The magnificent sweep of the expressway through the Salinas Valley is both pleasing and comfortable and relieves traffic congestion by permit-



UPPER—Looking southerly toward Paso Robles from the oasis on left. LOWER Looking southerly from San Miguel.

ting increased and uniform safe driving speeds, saving travel time and reducing driving fatigue.

G. D. Gardner, representing the Division of Highways, was Resident Engineer on both contracts. Hooper Knowlton was the bridge department representative on the San Marcos Creek Bridge. Robert Osborne was general superintendent for Madonna Construction Company on the grading contract, while John Vickrey, was general superintendent for the firm of Gordon H. Ball and San Ramon Valley Land Company.

FROM ISTANBUL

SULEYMAN TANSES
Koroyollari I. Bolge
Arastirma Sefi

ISTANBUL/BOSTANCI, TURKEY

DEAR SIRS: I received the November-December edition of your *California Highways and Public Works* magazine. Thank you very much for your sincere interest. It is really the best of its kind and I always learn something new when I read it.

I hope it will continue to be published in the same perfect way.

With my best wishes,

Yours sincerely,

SULEYMAN TANSES

MAN OF SEA LIKES HIGHWAYS

MR. KENNETH C. ADAMS, *Editor*

I wish to tell you how much I enjoy receiving the highway magazine. It is the most prized of all the magazines I take. I have spent most of the 15 years past in California and have traveled over most of the main highways and many of the secondary roads. I have followed quite closely the wonderful improvement of the highway system as so clearly shown in the highway magazine and by personal observation.

I came around Cape Horn in a sailing vessel and landed in Honolulu in 1896 and was employed as pilot at Pearl Harbor and Honolulu Harbor before retiring in 1939.

I wish to congratulate you on the wonderful magazine you put out and hope to receive it for the next few years that I am around. I am 79 years old.

Very sincerely,

RICHARD NELSON
2939 Park Street
Honolulu 17, Hawaii

NEW BOOK ON SURVEYING

The third edition of Elementary Plane Surveying, by Raymond E. Davis, Professor of Civil Engineering, University of California, published by McGraw-Hill Book Company, Inc., 330 West 42d Street, New York, is off the press.

All States Will Participate in New Road Tests

California State Highway Engineer G. T. McCoy, president of the American Association of State Highway Officials, has reported that detailed arrangements are now being made for financial and engineering participation by all 48 states, Hawaii, Puerto Rico and the District of Columbia in the forthcoming A. A. S. H. O. Road Test project in Illinois.

Announcement of the test, which is designed to measure the effects of vehicle weights on roads and bridges, was made in Washington, D. C., by Secretary of Commerce Sinclair Weeks. The project will cost an estimated $12,000,000, to be contributed by the participating states and territories, the Federal Government, and industry groups, with the State of Illinois paying most of the construction cost of the road itself.

McCoy disclosed that the test vehicles are tentatively scheduled to start rolling on the nearly 12 miles of pavement in north central Illinois some time in 1956. The project will be much larger than the two previous cooperative road tests, which, like the A. A. S. H. O. project, were conducted by the Highway Research Board of the National Academy of Sciences.

McCoy has been a member of A. A. S. H. O. committees which have been working with the U. S. Bureau of Public Roads, the Highway Research Board and the automotive, petroleum and tire industries for the past two years, planning the design of the project and the financial participation by the various interested governmental units and other groups.

An active California participant in the planning of the road test project, in addition to McCoy, has been Francis N. Hveem, Materials and Research Engineer of the State Division of Highways. Hveem was also a member of the advisory committee on the western road test project in Idaho.

In Memoriam

ADDISON KING NULTY

On February 23, 1955, death claimed another "Old Timer" of the Division of Highways. With the passing of Addison King Nulty, District X lost a colorful Resident Engineer.

Born in Missouri on August 17, 1885, King was educated in the deep South, receiving his B.S. degree in 1907 from the Virginia Polytechnic Institute. He went to work immediately as Chief of Party for the Interstate Coal and Iron Company of Virginia. In 1908 he moved to the West Coast and went to work as instrumentman for the City of Chehalis, Wash. After serving as surveyor for several railroad companies, King went to work permanently for the Division of Highways in District X in April, 1924.

During his stay, King was Resident Engineer on various projects throughout the district, many of which, except for seal coats, remain as he left them. King had the distinction of being Resident Engineer on the first portland cement concrete job in Northern California to use the, then new, Johnson Finishing Machine.

On August 4, 1943, King entered Bret Harte Sanitarium where he stayed until his death, with the exception of one year. He is survived by his sister, Mrs. Laura Kate Parks of Abingdon, Va.

Possessed of a keen sense of humor, King was a pleasure to work for and though he had been absent for 12 years, his passing was mourned by all who ever worked with him.

ARDENT READER

PACIFIC GAS AND ELECTRIC CO.
245 Market St.
San Francisco 6, California

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: I have read, cover to cover, several issues of your publication and have thoroughly enjoyed each issue for the information and leisure reading it contained.

Yours very truly,

R. H. WILLIAMSON
Department of Water Systems

Rotary Flail

Special Equipment for Weed Cutting on Highways Developed

By EARL E. SORENSON, Equipment Engineer

The control of grass, brush and weeds along the roadsides and dividing strips of highways has always been an expensive and difficult problem. The difficulties are caused by: first, nonuniform terrain, obstacles that cause damage to the mower such as tin cans, bottles, odd bits of metal, etc., that continue to be discarded by the passing motorists; and second, the problem of disposing of the cut material.

The present method of cutting weeds on highway roadsides utilizes conventional, heavy-duty mowing machines. In areas where the cut material must be removed, this operation is followed by a crew which disposes of the waste material. The use of conventional mowers is not too satisfactory as the machines are easily disabled by tin cans, wire, bottles, etc., which results in excessive repairs, costs in "down-time," and most important of all, lack of productivity while the mower is disabled.

Close-up view of new weed and brush flail

Rotary flail in operation, showing modern method of pulverizing weeds

Answer to Problem Found

An improved method for disposing of grass and weeds on highway roadsides and dividing strips has long been sought. The problem has been studied with a view toward developing a machine that could both cut and dispose of grass and weeds and yet be completely operated by one man. The satisfactory solution was, of course, a machine that cut the weeds, then completely pulverized them into a mulch that could be incorporated into the soil.

The answer to the problem has been found in a farm implement used for mowing, shredding and pulverizing and commonly known as a "Rotary Flail." This is a tractor-drawn machine which consists of a series of rotating flails operating within a steel housing, which passes over the top of the ground and cuts and pulverizes everything that is contacted. The machine, as sold for farm use, is designed for operation behind a tractor which is equipped with a power take-off to drive the flails. Its use is primarily for pulverizing corn stalks, cotton stalks, the tops of beets, vegetables or other cover crops. On the farm, the machine would ordinarily be used on ground well known to the farmer, with no obstructions such as the previously mentioned debris found on the highway roadsides. The power take-off on the farm tractor would therefore do a satisfactory job in farm-type operations of the machine. However, in order to adapt this unit for use on highway roadsides and dividing strips, it was necessary to strengthen and reinforce it and also provide it with an independent source of power to operate the flails.

Rotary Flail Rebuilt

A "Rotary Flail" was purchased and rebuilt for highway use by the equipment department. The machine was structurally reinforced and a 30-horsepower engine was added to drive the flails at a constant speed independent of the tractor speed. In addition, a remote, electrically-controlled hydraulic system to raise and lower the flails was provided. This was necessary in order to give the tractor operator full control of the machine on uneven ground. By structurally reinforcing the machine and making its operation completely independent of its towing power, it has proven very successful in tests conducted under the most severe conditions with excellent results and no damage to the unit. The unit may be operated at a speed equivalent to a fast walk and in heavy weeds only one pass is required to completely pulverize everything in its path.

It may be towed by a small tractor and, when so towed by a tractor, the operator has complete control due to the hydraulic system of raising and lowering the flails.

The effectiveness of the unit in handling heavy growth is illustrated in the accompanying photographs.

The results of the tests have indicated that if the machine is operated at a speed of four miles per hour, for a normal shift, approximately 25 miles of highway roadside may be cleared in one day, with no further work required for removing the debris.

Locking devices are provided on the machine that allow it to be towed to and from the job site at the regular highway speed of the towing unit.

The development of this self-powered "Rotary Flail" has been the result of the close liaison that exists between the Maintenance and Equipment Departments of the Division of Highways in assisting each other to develop machines and tools required for the specialized work of maintaining California's highways.

FOURTH ANNUAL BONNEROO HONORS CONTRACTORS

With Frank B. Durkee, Director of Public Works, making the presentation, the contracting firm of J. E. Haddock, Ltd., was the recipient of the "Topper," a miniature golden roller trophy, for having completed the best highway contract in District VII during the calendar year 1954. Scene of the award presentation was the fourth annual "Bonneroo," a stag banquet sponsored by the District VII Construction Department of the California Division of Highways, which was held at the Rodger Young Auditorium in Los Angeles on May 6, 1955. Approximately 600 state highway employees and representatives of contracting firms, construction equipment companies, and construction materials suppliers attended the annual affair.

R. M. Gillis, Deputy State Highway Engineer, presented a similar trophy to Herbert Belford, State Resident Engineer in charge of the winning project, a section of the Harbor Freeway between Olympic Boulevard and Second Street, in downtown Los Angeles.

The annual affair, the fourth of its kind, is held for the primary purpose of honoring those contractors and resident engineers who completed what are judged the best 10 highway contracts in District VII, comprising Ventura, Los Angeles, and Orange Counties, during the preceeding calendar year. The winners for 1954 are:

Deputy State Highway Engineer R. M. Gillis (right), presents Herbert Belford, Resident Engineer in charge of winning project, with trophy.

No. 1

Harbor Freeway, Los Angeles County, Olympic Boulevard to Second Street. J. E. Haddock, Ltd., Contractors. H. E. Belford, Resident Engineer.

No. 2

Ventura Boulevard in Ventura County, Route 155 to Conejo Grade Summit through Newbury Park. Fredericksen & Kosler, Contractors. L. S. Higley, Resident Engineer.

No. 3

Santa Clara Avenue in Ventura County, between Central Avenue and State Highway Route 9. Baker & Pollock, Contractors. W. K. Loban, Resident Engineer.

No. 4

Hollywood Freeway, Los Angeles County, Mulholland Drive to Hollywood Boulevard. Bongiovonni Construction Co., Contractor. F. E. Sturgeon, Resident Engineer.

No. 5

San Bernardino Freeway, Los Angeles County, Jackson Avenue to Rosemead Boulevard. Griffith Co., Contractors. B. N. Frykland, Resident Engineer.

No. 6

Long Beach Freeway, Los Angeles County, 223d Street to Atlantic Avenue. Ukropina-Polich-Krol (Atlantic Constructors), Contractors. H. F. Meinke, Resident Engineer.

No. 7

174th Street, Los Angeles County, between Inglewood Avenue and Normandie Avenue. J. E. Haddock, Ltd., Contractors. L. W. Sixt, Resident Engineer.

No. 8

Long Beach Freeway, Los Angeles County, Dominguez Street to Del Amo Boulevard. Webb & White, Contractors. F. W. Buck, Resident Engineer.

No. 9

On Route 101 in Ventura County, between Calleguos Road and Central Avenue through Camarillo.

. . . Continued on page 37

On the Malibu

New Highway Construction On US 101 Alternate Completed

By KENNETH MOCK, Resident Engineer

A CONTRACT awarded to A. Teichert and Son, Inc. of Baldwin Park for 12.3 miles of State highway construction of US 101 Alternate was completed on February 16, 1955. The major part of this construction project, extending from Little Sycamore Canyon in Ventura County to Escondido Beach in Los Angeles County, was through the historically famous Rancho Malibu.

This rancho originally was a Spanish land grant to Don Jose Bartolome Tapia in 1804 and comprised some 13,000 acres with 22 miles of shore line along the Pacific Ocean. The U. S. District Court in making settlement of California land grant cases gave title in 1864 to one Matthew Keller who had paid the Tapia heirs the sum of $1,400 for quit-claim deed to the ranch. Title to this ranch then passed to Frederick Hasting Rindge for $300,000. In 1905 the Rindge heirs constructed a narrow gage railroad from Santa Monica extending nearly 40 miles along the coast line, abandoned portion of which can still be seen from the State highway.

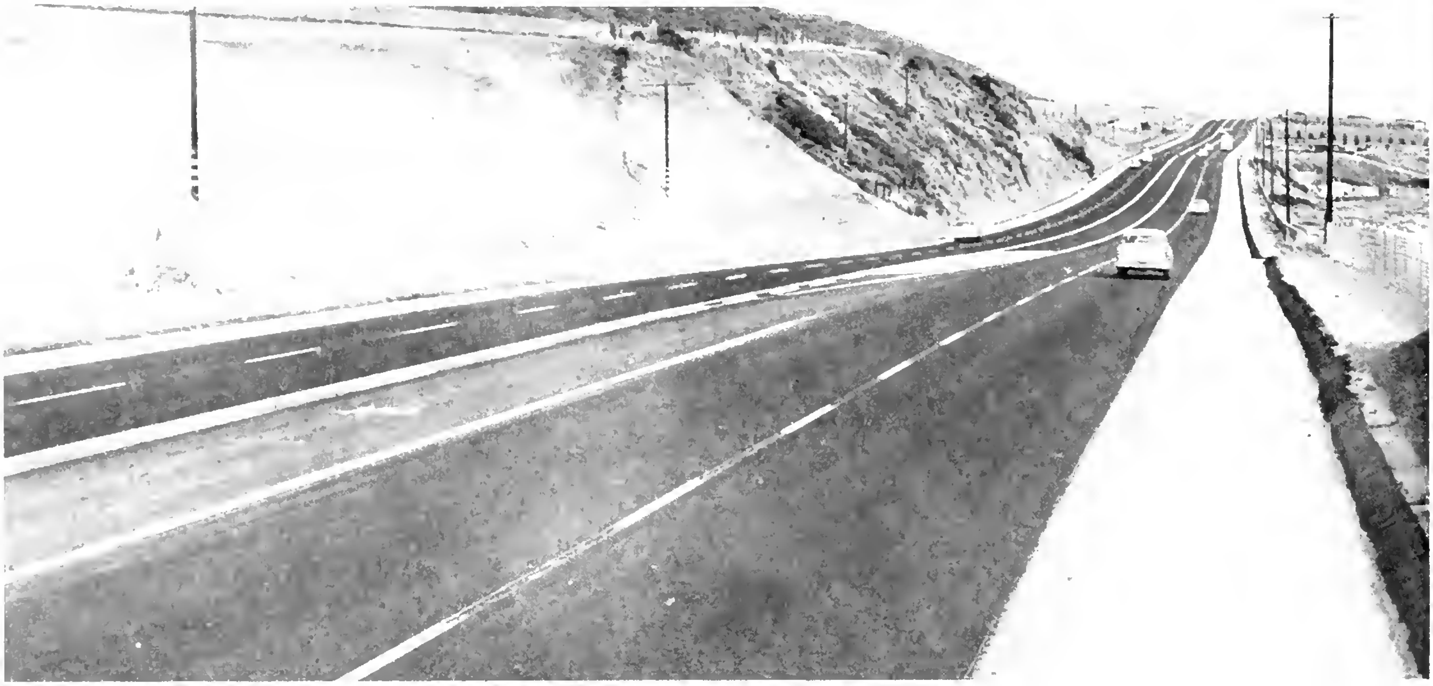
Extensive Litigation

Preceding the building of the original State highway through the Rancho Malibu there was extensive litigation. This is concisely summarized by Dave Duncan, writing under the title, "Historical Malibu." With Mr. Duncan's permission the following is quoted:

"Between 1908 and 1925 raged the longest and most bitter contest of its kind in California's history. County, State and Federal Government took turns in attempting to force the granting of rights-of-way through the ranch for road purposes. Rindge's widow, May K. Rindge, spent a fortune in atorney's fees alone in the contest. High fences were built along the ranch boundaries and line-riders, armed to the teeth, rode the ranch boundaries in an effort to repulse and keep out surveying parties.

"Finally, on October 14, 1925, the superior court handed down the concluding decision in this most famous of road cases, giving the State right of way for the highway, and awarding the Marblehead Land Company, which Mrs. Rindge and her three children, Sam, Fred and Rhoda, had founded, a judgment of $107,289 for damages to the ranch property. The highway was constructed and immediately squat-

Looking northeasterly along completed construction in Zuma Canyon, showing in foreground channelization with Bonsall Drive and Westword Beach Road



UPPER—Looking easterly from Little Sycamore Canyon, showing in foreground channelization lane for Yerba Buena Road. This section of the project is in Ventura County, with Los Angeles county line just beyond limits of photograph. At left, grading operations are in progress by abutting property owner under permit, to provide a location for a service station, business office and restaurant. LOWER—Looking easterly along completed divided highway, showing in center the widened bridge across Arroyo Sequit Creek. Extending, center left, is Mulholland Drive, that goes up Arroyo Sequit Canyon. The striping has been carried out to provide left turn lane into Mulholland Drive.

ters swarmed in. Another struggle began, which culminated in the Spanish land grants being upheld by the highest courts in the land and the squatters were finally moved out."

Original Construction

The original highway construction through the Rancho Malibu provided two-lane pavement and surfacing that was under later contracts widened to three- and four-lane width. The construction undertaken by A. Teichert and Son, Inc. consisted of resurfacing approximately 6.6 miles of existing four-lane highway and channelizing various strategic road intersections with concrete curb, placed as recommended by the District Traffic Department. The remaining 5.7 miles consisted of eliminating the old three-lane pavement that had been constructed on an extremely rolling grade line established some 30 years ago by widening the grade line improvement, or, as one native so aptly put it, "taking the waves out of the highway."

Roadway excavations and embankments were widened, crown vertical curves lowered, and grade sags filled in order to produce uniformity of grade line and obtain an increased sight distance for safety of motorists. Public traffic was carried through construction at all times with as little inconvenience as possible. This sometimes introduced difficult problems of traffic handling. Where the height of the fills was excessive and they could not be brought to finished grade and still maintain a two-lane width of roadway for through traffic, it was necessary to adopt a three-stage construction plan. The first stage was to construct one side of the fill as high as it could be carried to maintain a 24-foot width on top. A temporary surface was placed, and traffic then routed over it. The second stage was to construct the other side of the fill to final grade and place the permanent pavement thereon. The third stage of construction was to finish to ultimate grade the portion of the below grade fill that had been carrying public traffic.

Tons of Crushed Rock

Some 276,000 tons of crushed rock were required as base material, mineral aggregate for cement-treated base and mineral aggregate for plant-mixed surfacing. The contractor obtained this by quarrying ledge rock in Big Sycamore Canyon and crushing it by the following sequence of operations:

(1) Hauled from quarry with 20-ton trucks and end-dumped into 48-inch x 54-inch jaw crusher.
(2) Belt conveyed to a 24-inch x 36-inch jaw crusher.
(3) Vibrated over scalping screens.
(4) Dropped into 8-inch cone crusher.
(5) Belt conveyed into a secondary roll crusher.
(6) Belt conveyed to bunkers or stockpiles.

Looking easterly along Trancas Beach, showing newly installed channelization, center left, to provide safe ingress and egress to community development. Dume Point is shown in background left.

In order to eliminate excessive "secondary shooting," 40 tons of powder was used in a 100-foot "coyote" hole, with four branch tunnels, to loosen the ledge rock and break it to crushable size. Plant-mixed surfacing was produced at the crushing site and placed on the street at an average rate of 1,100 tons per day.

The four inches of plant-mixed surfacing was placed on eight inches of cement treated base material, having under it from four to twelve inches of rock subbase. The completed improvement consists of two 24-foot plant-mixed surfaced roadways with eight-foot shoulders, separated by a 14-foot paved median strip, outlined by double stripes.

The writer was resident engineer on this contract working under the general supervision of Assistant District Construction Engineer E. A. Parker, Assistant District Engineer Frank B. Cressy, and District Engineer W. L. Fahey. The contract which was completed February 16, 1955, and nine days later formally accepted by Mr. Frank B. Durkee, State Director of public Works, makes more readily accessible the picturesque shore line of the Rancho Malibu with its intriguing canyons and mountainous back country. This is the country which in the early twenties attracted a group of movie stars, writers, directors and producers to establish what has been called "the movie colony" of Malibu Beach. Many finely appointed homes were erected along the ocean front, complete with tennis courts and swimming pools which are still extensively used. Even more rapid development than has already occurred is not anticipated in the building of fine homes and expansion of public recreational facilities along the beautiful beaches.

WINS PRIZE IN PHOTOGRAPHY

Harry B. Norris, a Division of Highways warehouse employee who retired in November, 1952, has achieved fame as a color photographer in his home community of Arcadia.

When Norris retired, his fellow-workers at the Los Angeles warehouse of the Service and Supply Department presented him with a color camera. With Mrs. Norris, he then set off for a trailer tour of the United States.

One of the slides resulting from the trip, "Autumn Aspen in Colorado," was judged grand prize winner in the First Grand Salon held recently by the Arcadia Colorsliders Club.

Cooperative Project

Gilroy Highway Widening Celebrated

By F. W. MONTELL, City and County Cooperative Projects Engineer—District IV

Modernization of historic Monterey Street through the City of Gilroy, on U. S. 101 was fittingly celebrated by city officials. This project, which included a contract for widening of Monterey Street by state contract with local cooperation, a related drainage contract by the city, and a street lighting modernization program under city supervision, has resulted in a street thoroughly modern in every respect, with greatly improved capacity for motor vehicle and pedestrian traffic. Greater convenience for shoppers and local traffic transacting business in the downtown area, and uninterrupted service to all traffic has resulted from the improved cross-section of the street, and improved drainage conditions on Monterey Street have further provided for the free flow of traffic where formerly impeded during periods of heavy rainfall.

History of Project

Monterey Street, which is the principal business street of Gilroy, was originally paved with portland cement concrete pavement 15 feet wide and four inches thick, in 1914. The pavement was widened and thickened and curbs constructed prior to 1921 to a final width of 60 feet between curbs. As a result of successive reconstruction projects, the cross slope became excessive and this, coupled with the unusually high curb face in the business district (as high as 12 inches), caused difficulty to shoppers in opening car doors, with the result that vehicles parked well out from the curb restricted traffic in the adjacent traveling lane.

Because of this condition, city officials originated discussions with the Division of Highways as early as 1938, looking toward the eventual elimination of the excessive crown of the pavement and high curb face through the business district. At that time it was felt that plan lines should be established on Monterey Street to provide for an eventual widening to 68 feet between curbs, which would provide four 12-foot driving lanes with eight-foot parking lanes, and a four-foot curbed median strip. This could be accomplished by reducing the sidewalk width from 14 feet to 10 feet on both sides of the street.

Conferences Held

In view of the many critical deficiencies in Santa Clara County, the correction of which had to be undertaken during the following decade, no further action could be taken toward achieving adequate standards on Monterey Street until August 12, 1948, when at the city's request, a meeting was held at the District IV office of the Division of Highways to discuss the possibility of bringing Monterey Street up to modern standards. At that time, the city officials proposed that the widening be accomplished as a cooperative project in order to insure financing of the project at the earliest possible date. By this time conditions for the through traffic and shoppers had become aggravated due to the increased volume of traffic and local business.

Between August, 1948, and January, 1949, several meetings were held to consider engineering problems concerning the proposed project as well as methods of financing the city's share of the improvement, and on January 1, 1951, the city's one-half cent sales tax earmarked for its share of the widening of Monterey Street became a reality.

With the city's share of the financing assured, engineering studies were resumed by both the city and the State with the objective of including the project in the State's 1953-1954 Fiscal Year budget since it appeared that the city would be in a position to fulfill its financial obligation at the time the project could be completed, which was estimated at January, 1955. The District Design Department then proceeded to prepare plans and specifications for advertising the widening of Monterey Street as a state contract. In addition to financial participation, the City of Gilroy through its city engineer, W. J. Hanna, furnished preliminary engineering data to the District Design Engineers.

Construction Features

The modernization of Monterey Street consisted of three phases: First, in order to correct bad drainage conditions resulting from overloaded gutters on Monterey Street, the city undertook a drainage contract to provide an additional outlet to Miller Slough. This contract, known as the Eighth Street Outfall, relieved the bad drainage conditions both above and below Monterey Street by providing faster run-off. This project, costing $80,444, was completed by the P. and E. Company, Inc., contractors, prior to the widening project for Monterey Street. The widening project was the second phase, and was covered by the contract awarded by the State to the Granite Construction Company of Watsonville on June 24, 1954.

This contract provided for drainage correction on Monterey Street, the widening and resurfacing of the roadway, the construction of new curbs of standard six-inch height, and the construction of a four-foot curbed median strip paved with portland cement concrete. In addition, a traffic signal was installed at the intersection of First Street and Monterey Street, which is also the intersection of State Highway Routes 2 and 32.

The third phase provided by the City of Gilroy consisted of the installation of double-pendant electroliers in the center dividing strip. These replaced obsolete electroliers of insufficient illuminating capacity which were located in the sidewalk area on both sides of the street. The new street lighting system utilizes mercury vapor luminaires and results in a well-lighted roadway surface through the business area. The contractor on this work was The Howard Electric Company of Gilroy.

The cost of the combined cooperative drainage and widening project was approximately $368,000, of which $150,000 was contributed by the City of Gilroy, the remainder being state highway funds. The State's widening contract was completed March 1, 1955, and the city's lighting contract was completed on March 25, 1955.

Dedication Ceremonies

At dusk on March 25, 1955, in the presence of several hundred interested spectators, brief but fitting ceremonies were held to celebrate the consummation of several years of planning on the part of city and state officials. Former Mayor George Milias officiated at a ribbon cutting ceremony in front of the city hall. Just prior to this, the lights were turned on for the first time.

Dedication ceremonies were arranged by the Gilroy Chamber of Commerce. Councilman Carl Pate represented Mayor George Mason who could not be present.

Brief congratulatory remarks were made by former Mayor Milias under whose term of office negotiations were first undertaken with the State. He was followed by Supervisor Arthur W. Brown of Santa Clara County and State Senator John F. Thompson. Resident Engineer W. S. Smith, in charge of the State's contract, was introduced and thanked the city for its cooperation and understanding during construction operations. Colonel John H. Skeggs, retired Assistant State Highway Engineer, District IV, who was responsible for the preliminary planning of this project, expressed gratification that the project had been successfully completed after many years of planning. He lauded the city officials for their foresightedness and initiative in overcoming financial obstacles and thus assisting in obtaining a street adequate for future needs. Chelso A. Maghetti, Secretary of the California Highway Commission, congratulated the city on the consummation of the project, followed by Fred Bagshaw representing Frank B. Durkee, Director of Public Works.

UPPER—Photo taken in 1951. LOWER—Photo taken in 1955. Both on Monterey Street showing the difference in typical parking conditions. The high crown and high curb shown in the earlier photo made it difficult to open car doors unless the car was parked some distance from curb, as shown in the photograph.

BONNEROO

Continued from page 32 . . .

Griffith Co., Contractors. R. A. Collins, Resident Engineer.

No. 10

Colorado Freeway, Los Angeles County, between Avenue 64 and San Rafael Avenue. Guy Atkinson Co., Contractors. L. E. Steele, Resident Engineer.

The contracts are rated primarily on excellence of workmanship on the various items of work and smoothness of the finished pavement. Complexity of the job, engineering cost, public relations, and diligent prosecution of the contract are also factors which are considered in determining the 10 best projects.

In addition to the "Toppers" awarded to the contractor and the resident engineer, Certificates of Merit were awarded to the following men in recognition of their respective contributions to the construction of the best contract: H. Rollston, superintendent for the contractor; W. F. Bastues, bridge department representative; R. Delaney (deceased), principal assistant resident engineer; C. Palmer, principal assistant resident engineer; G. Camps, G. Dickey, J. Upham, W. Rhodes, M. Camp, F. Bedal, M. Meizlisch, J. Nausler, C. Fremed, J. Callahan, R. Hagstrom, assistant resident engineers; H. Schindler, Materials Department representative; H. Kurland, D. Neuman, chiefs of party.

J. P. Sinclair, District Engineer, represented B. W. Booker, Assistant State Highway Engineer, under whose over-all supervision the project was designed and constructed.

DEVELOPMENT OF SIGN ROUTE 75 FROM PALM CITY TO CORONADO

Highway Commissioner Fred W. Spears, left, dedicates new highway. Seated, left, Supervisor Dave Bird and C. A. Maghetti, Secretary, State Highway Commission

On the afternoon of April 23, 1955, the South Bay District Chamber of Commerce celebrated the completion of a $350,000 highway project. The celebration was attended by a large representative crowd of citizens of San Diego County and particularly the South Bay district. C. A. Maghetti, Secretary of the California Highway Commission officiated with David Bird, local county supervisor, in the ribbon cutting, and Highway Commissioner Fred Speers addressed the gathering, outlining the recent highway accomplishments in San Diego County.

The project which is 1.9 miles in length, extending from the three-level interchange structure on the Montgomery Freeway at Palm City along Palm Avenue to Seventh Street in Palm City, provides a four-lane divided highway with a 22-foot separation together with proper channelization and 24-foot wide parking lanes on each side with right of way 150 feet in width. This will provide for an ultimate expansion of six lanes for through traffic.

The three-level Palm Avenue interchange structure connecting with the Montgomery Freeway was completed in 1952 as a unit of the full freeway development on US 101. This facility is common to both US 101 and SSR 75 and provides for adequate interchange of traffic between the two major routes.

Extension Provided For

Funds have been budgeted and plans have been completed for the extension of the four-lane divided section northerly along the Silver Strand to Dana Place in Coronado. This project will be under construction this summer and will provide a much-needed improvement on a heavily traveled highway which is the only highway outlet from the extensive Eleventh Naval District developments on North Island. It also provides direct access to the Naval Amphibious Base on the strand just south of the Coronado business district and provides the only access to a large California Division of Beaches and Parks development where extensive parking and recreational facilities are being provided. Proper connections are to be made for the entrance to the state park in the way of a separation structure so that there will be no surface intersections. Three pedestrian underpasses are to be constructed as a part of the project connecting the state park properties on both the east and west sides of the highway and railroad.

The completion of the entire development on SSR 75, extending from Coronado to US 101 will amount to approximately $2,000,000 for construction and rights of way.

The improvement as outlined above was made necessary by the rapid increase in traffic along the Silver Strand. The present volume of traffic is approximately 7,000 vehicles per day and is an increase of about 32 percent since 1950. The heavy volume of traffic on the narrow two-lane road with the type of traffic developed through the federal installations, state park and large residential area in the South Bay district caused a heavy accident frequency and made necessary the improvements recently completed and underway.

Freeway Accident Rate in State Is the Lowest

California's full freeways are the safest highways in the world, Governor Goodwin J. Knight believes.

Following the pattern of previous years, the over-all accident rate on the heavily traveled rural and urban full freeways in California in 1954, the Governor reported, was about one-half the rate for the rural state highway system as a whole, and the fatality rate was less than one-fourth as high.

The freeway fatality rate last year was 1.92 for every 100 million vehicle-miles of travel. This, the Governor pointed out, is considerably lower than the rate of 2.43 for a portion of the New York State toll Thruway which was publicized nationally several months ago as the safest highway facility in the world.

Lowest Fatality Rate

The 1954 California freeway fatality rate, one of the lowest ever recorded, is a drop of about 10 percent from the 1953 rate of 2.12. It went hand in hand with a comparable reduction in traffic fatalities state-wide. The Governor pointed out that 1954 was the third successive year of marked reductions in fatalities on the State Highway System in California despite a constantly increasing volume of traffic.

The average amount of traffic last year on the 131 miles of full freeway which had been in operation long enough for valid statistical compilations was 45,194 vehicles a day. (California now has 180 miles of full freeway completed, another 152 miles under construction and an additional 62 miles budgeted and scheduled for early construction.)

First Freeway in 1940

The first California freeway was opened in 1940. Since that time, travel on full freeways in this State has amounted to nearly six and a half billion miles, with an unmatched composite safety record over the 14-year period of 2.15 fatalities for every 100 million miles traveled.

"The consistent fine safety record on full freeways," Governor Knight stated, "is a clear indication that modern highway engineering can contribute substantially to saving lives in the face of mounting traffic volumes. It also bears witness to the wisdom of California's emphasis on full freeways for our most heavily traveled routes. We are now more determined than ever to push our freeway program ahead as rapidly as possible."

The Governor added, however, that freeways will never constitute the complete solution to the traffic accident problem.

"Despite all the built-in safety features of freeways and despite our enforcement and education campaigns, there were still 39 lives lost on freeways last year," he said. "We must continue to seek new ways to bring home to every motorist the fact that on his own behavior at the wheel rests the major responsibility for his safety and that of others."

NICKERSON GETS TWENTY-FIVE YEAR SERVICE PIN

MERRITT R. NICKERSON, Chief Photographer for the State Department of Public Works, had a new experience recently. He had to pose for pictures of himself. He has taken thousands of photographs for the department. The occasion for his posing instead of manipulating the camera was the presentation to him by G. G. McGinness, Service and Supply Engineer, Division of Highways, of his 25-year service certificate and pin.

G. G. McGinness, right, presents M. R. Nickerson with service pin

Nickerson was born in Nevada City, California, and moved to Sacramento in 1913. He is a veteran of World War I, having enlisted in Troop B, a cavalry unit composed mainly of Sacramento men. Later this troop with three others served in France as the 145th Machine Gun Battalion.

Upon returning in 1919 he worked for District I, Division of Highways, in Dunsmuir. He left the state service in 1920 and was employed by a local commercial photographic concern for about 12 years, during which time he handled various contract photographic assignments for the State of California and the Division of Highways.

He was re-employed by the Division of Highways in 1932 and in his present work supervises all photographic work for the department, which includes *California Highways and Public Works* magazine, aerial photography and photographs for the various divisions of the department.

Highway Pioneer Dies

John R. Graham, father of the "Yosemite-to-the-Sea Highway," died on May 2d in Hayward at the age of 87.

One of the major segments of the highway he helped develop is now the Pacheco Pass route which links Highways 101 and 99.

Mr. Graham was a pioneer leader in the State's "good roads" movement.

He lived in Merced until his retirement several years ago. He was a former Merced City Councilman and a former Merced County Supervisor.

Since his retirement, he lived at the home of a grandson, R. Bruce Graham of 20060 Times Avenue, Hayward.

REVIEW OF CEMENT TREATED BASES IN CALIFORNIA

By CARL ALZUETA, Assistant Engineer, Construction Department

Cement treated bases have been used extensively by the California Division of Highways for about 15 years. During this period the State has constructed more than 29,000,000 square yards of cement treatments, or about 35 percent of the total amount placed throughout the United States. As a result of this extensive construction it is now possible to review to good advantage the specifications and current practices that have evolved in California from so much experience in constructing many miles of these bases.

California now specifies two types of treatments, cement treated subgrade which is a solidification treatment under concrete pavement and cement treated bases which are intended for structural use directly under bituminous surfacings.

UPPER—Cement treatment in 1937. Bagged cement spotted along grade is ready for spreading on this pioneer project by state forces. LOWER—Teams of tractors tow farm plows to mix in-place material and cement.

Economic Advantage

Cement treated bases are used with the objective of obtaining a limited slab strength greater than natural materials but less than that of concrete. To conform to the degree of anticipated loading, treated bases are subdivided into three specific classes of A, B and C with Class A being the highest quality.

The principal advantage in using Class A and B cement treated bases is that a reduction in required total thickness of the structural section, as compared to untreated bases, can be obtained due to the slab strength and the resulting high cohesion value assigned in the California design procedure. Another economic advantage is realized by being able to utilize cheaper local materials rather than importing expensive quality aggregates.

California specifies Class A cement treated base where traffic demands are high and good quality untreated base materials are difficult to obtain economically. Class B bases are, in general, comparable to Class A except that a lesser amount of cement is used and strength requirements for Class B are approximately 50 percent of that required for Class A.

Requirements

In all cases where the thickness of cement treated base exceeds seven inches, the Standard Specifications require that the base be placed and compacted in two or more layers of approximately equal thickness. In this type of construction the Class B base is used extensively for the bottom four-inch layer. However, it is not confined to this type of construction alone.

Class C cement treated base employs the use of relatively small amounts of cement (1 -2$\frac{1}{2}$). It is used for several different reasons, depending upon the circumstances. For example, it may be used to:

1. Improve the resistance value (R value) of material selected from roadway excavation or imported borrow.
2. Offset the chance inclusion of adverse clay in base materials.
3. Provide a more stable working table for construction, particularly where sandy soils are involved.

4. Bring substandard material up to specification requirements.

In general, Class C cement treatments are applied to base materials whose supporting value is slightly less than that required by design. Since the amount of cement is small the uniformity of distribution becomes a problem in fine cohesive materials. This type of treatment is not recommended where the margin of correction is large.

Cement Treated Subgrade. In California practice cement is added to the layer of material directly under concrete pavement for the purpose of providing an erosion resistant layer. A comparatively low cement content is normally used on this type of work. While no definite compressive strength is required for cement treated subgrade, it is generally recommended that they be designed on the basis of approximately 200 to 300 psi compressive strength at seven days. Since this subgrade treatment is not intended to provide additional structural strength for the pavement, high compressive strengths indicate an uneconomical use of cement.

Materials. Generally speaking, a wide range of mineral aggregates can be used for cement treatments. However, because of construction and economic limitations usually materials of a somewhat granular nature with sufficient binder are used.

Practically all soils can be stabilized with cement, but not all soils can be stabilized easily and economically by this method. Thorough pulverization of the soil and thorough mixing with cement and water are prerequisites to success. Hence, cement treatments are limited to granular and friable soils which can be pulverized readily. Soils which have a high silt or clay content require more cement and present difficulties during construction, particularly during pulverizing and blending.

Conversely, materials deficient in fines require high percentages of cement to develop the required compressive strengths. In this regard a desirable relationship has been found to exist between the fine and coarse material. For cement treatments this relationship is based on the amounts passing the No. 30 and No. 200 sieves

Modern cement treated operation. UPPER—Cement is hauled to project in large truck-trailer combinations from which it is bulked off into smaller distributor trucks. CENTER—Cement is uniformly distributed to the windrow. LOWER—Mixing train follows. Tractor-powered mixer works windrows, adding water from following tank truck. Towed blade breaks down and distributes it. A roller immediately compacts the treated material.

and is generally expressed as follows: "—not less than 15 percent or more than 40 percent of the material passing No. 30 sieve shall pass the No. 200 sieve." For example, a material having 20 percent passing the No. 30 sieve should have between 3 percent and 8 percent passing the No. 200 sieve.

When Class C cement treated base is specified and fine grained sandy materials are being used, the maximum amount of cement in the specification range should be added. With this type soil, failures have occurred near the surface of the base itself because of lack of shear strength in the sandy material. Incorporating coarse aggregates or portions of an existing surfacing, also improves the shear strength of these bases.

Mixing. California specifications permit the contractor to choose between mixing the cement treated base on the road or in a plant. The road mixed method has proven most popular with the contractors since it permits a much larger daily production. In addition, road mixing is a separate operation utilizing a different type of equipment and for that reason both the base construction and bituminous plant mix can be done concurrently without the necessity for two separate plants. On certain projects because of local conditions no choice of mixing methods is permitted and the type of mixing is dictated. The average cost of mix and compact exclusive of cost of material in 1953 was $0.21 per square yard.

Cement treated subgrade is completely road mixed since it is naturally adapted to this type of operation. Contractors have developed equipment trains that operate from the pavement side forms to shape, windrow and trim the treated subgrade. Cement treatment is always done before placement of the side forms because of the difficulty experienced in placing them accurately on the hardened surface. The average cost of this treatment, exclusive of cost of material, in 1953 was $0.24 per square yard.

Plant Mixing. Contractors generally elect to plant-mix cement treated base when it is to be used for shoulders, borders or ramps, or where road mixing operations may be seriously hampered by traffic. Variable width construction, in particular, is not suited to road mixing because of the difficulty encountered in proportioning and controlling the cement and water properly.

California specifications require that the aggregates be separated into two sizes, one size to consist of material passing a No. 4 sieve and the other retained on a No. 4 sieve. The exact size of the separation screen is not important as long as the finished product conforms to the above requirement. The size of the screen opening the contractor will elect to use will depend upon the amount of retained moisture and the amount of fines in the aggregate. It is not the intent of the specification to require the use of a drier for aggregate containing less than the optimum amount of moisture. However, under certain conditions contractors may elect to dry the mineral aggregate in order to facilitate screening. In this event, heating of the aggregates is limited to not more than 150 degrees F. This will prevent flash set of the mix with a resulting loss of compaction and strength.

Where bulk cement is being used, it should be prevented from hanging up in the weigh hopper and chutes. Vibration may be provided if necessary to maintain a free flow. The mixer should be properly cleaned daily and since build up of cement and aggregate on mixer shafts, paddles, and liners is rapid, any neglect even for a short time materially reduces the capacity and efficiency of the mixer.

The horsepower demand in mixing this type of material is considerably more than that for a bituminous mixture. The normal practice is to space the paddles farther apart and reduce the number per shaft, but this can be overdone. If there is any question as to the efficiency of mixing, the power should be cut off at the end of the mixing period, and samples obtained from each end and the center of the mixer, and test specimens fabricated from each. Comparisons of compressive strength will serve as a check on the distribution of cement.

Mixing—Road. Under the road-mix method it is essential that windrows of material to be treated be sized immediately prior to mixing. Where material is mixed from a blanket the depth of mixing should be checked. This is required in order to maintain a constant proportion between the cement and aggregate and to provide a uniform consistency. For similar reasons, material that is brought in for treatment should be mixed as uniformly as practicable at the source.

Cement is spread on the windrow in bags by hand or in bulk by means of a distributor truck. In dumping the bags, the cement should be spread as uniformly as possible throughout the length of windrow that the bag is to cover. Because of lower costs California contractors generally use bulk cement.

Accuracy in the spread of bulk cement by means of mechanical devices may be checked by laying out building paper in the "V" notch and spreading upon it, after which a measured section is gathered up and weighed. It has been found that the spread from certain distributors is influenced by the quantity of cement in the bin over the screw. When the bin is full, larger amounts of cement will be spread than desired; and when the bin is nearly empty, less cement is distributed. It is recommended that the spread be checked at various bin levels.

Test Specimens

If the efficiency of mixing or distribution of cement is questioned on a project, three test specimens are taken from material from any one point along the windrow; one from each side midway in the height of the windrow, and one from the center of the bottom face. Class A and B cement treated bases and cement treated subgrade are tested by compressive strength cylinders and Class C cement treated base by stabilometer tests to indicate the degree of uniformity.

The following types of road mixers are being employed by California contractors:

1. The pugmill or auger machine that mixes from a windrow. This type is the most commonly used by the contractors.

The pugmill or auger mixers should be carefully checked to see that the material near the bottom of the windrow is being lifted from the subgrade and is receiving thorough mixing.

This type of mixer can also be easily overloaded with lower resultant uniformity of mixing. As the trend is toward thicker bases the width of lane and thickness of layer that can be mixed in a single pass must be carefully studied. The manufacturer's recommendation should be followed, and the uniformity of mixing checked periodically by methods previously described.

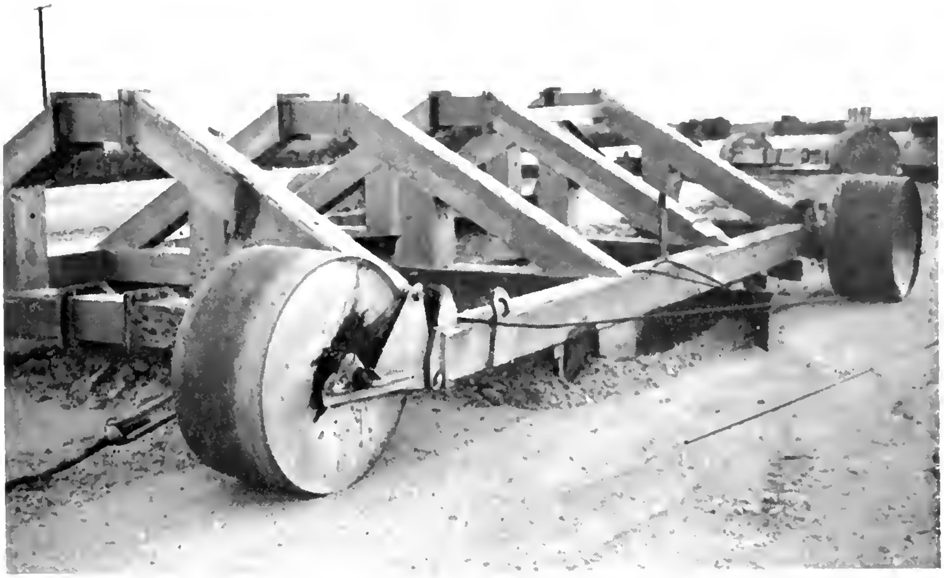
2. The transverse shaft type that mixes the material by means of revolving paddles. This mixer does not require that the material be windrowed, which means less interference to traffic. On narrow mountain sections this results in a minimum of interference to traffic.

The mixer should be checked for depth and uniformity of mixing. Every effort should be made to add the cement to the mineral aggregate when the latter is dry. Balling of the cement results if the cement is placed on damp aggregates and may require excessive mixing passes to blend in uniformly.

3. The elevating mixer which combines a loader and a pugmill unit. This mixer has the advantage that it can mix large windrows of material, making it possible to treat larger quantities of material in a single pass.

Spreading and Compacting. Since cement treatment hardens rapidly after compaction it is generally more difficult to obtain a satisfactory subgrade for the bituminous surfacing. Riding qualities of the bituminous pavement superimposed on a cement treated base are largely influenced by the spreading of the cement treated base, supplemented by the trimming with the self-propelled blade grader. The trimming operation is highly important and should be very carefully performed. The more care taken in the spreading, the less trimming will be necessary and less scarring of the surface will result.

Strength of cement-treated materials is largely dependent on the density obtained. To insure good compaction, it is essential that the base be compacted as soon as possible after the material is mixed. Sufficient moisture must be present in the mix to provide lubrication and maximum density. Slightly more than this amount will result in spongy spots during the rolling. Best results are generally obtained with a moisture content just short of instability or "quaking" under a roller.



Towed frame developed by a California contractor to scarify and windrow in-place material preparatory to cement treatment. Equipment can be adapted to work from side form by replacing wide base steel wheels with narrower flanged wheels.

If a motor grader is used to spread the cement treated base, it is recommended that a roller be used after the first pass of the grader in order to remove the tire tracks immediately. If the tracks are filled in before rolling, they contain more material than the adjacent areas, resulting in an irregular section and uneven compaction.

Between the operations of compaction and finish surface rolling the surface is trimmed where necessary with a blade grader and the cut material wasted.

Shaping or blading after spreading has been found undesirable as it develops horizontal planes, or laminations, in the material. Every effort should be made to make the initial spread smooth and uniform.

The trimming should be done before the cement treated base has hardened in order to reduce surface tearing to a minimum. A pneumatic-tired roller equipped with a water spray bar provides the final compaction and a close-knit texture to the surface.

Thickness of Layer. Cement treated bases should never be placed in layers less than 4 inches in thickness. Thinner layers laminate and may develop slippage between the planes.

Surface Texture. There have been instances where the bituminous surfacing placed on cement treated bases has slipped because of a smooth slick base surface texture. This condition is usually encountered with fine grained materials such as sand or disintegrated granite which are lacking in large particles. Under such conditions consideration should be given to roughening the surface texture by means of a sheepsfoot tamper or other such roller. Tractor cleats should be avoided since they tear the surface excessively.

Curing Seals. Except for Class C cement treated bases, the surface of these treatments are kept moist until the application of the asphaltic emulsion curing seal. Class C cement treated base which has no compressive strength requirement generally does not receive a curing seal and is usually primed as in the case of any untreated base.

Bituminous membranes are applied to cement treated bases for the following purposes:

1. To retain moisture during the curing period.
2. To protect the surface under the action of traffic.

3. To provide a tack coat for bituminous surfacing.

An MC-2 curing seal is added to cement treated subgrade not only for the first two purposes but also (and primarily) to toughen the surface and provide additional resistance to erosion.

Traffic Through Construction. It is considered advisable to close cement treated bases to traffic for a period of seven days of curing; however, this is not always practicable, and the specifications permit immediate use when necessary.

Every effort should be made, however, to keep traffic off of the new base until it has developed sufficient slab strength to resist breaking up under the traffic loads. This is of particular importance during fall, winter and early spring construction seasons when the presence of excess moisture may cause a yielding subbase.

Class A and B cement treated bases, if placed on yielding subbases and subjected to traffic before they have developed sufficient slab strength, may break up and defeat the purpose of the treatment. This condition, if it occurs, can lead to ultimate failure of the section.

California has found that cement treatments have very little resistance in themselves to traffic abrasion. Where heavy traffic must be carried over cement treated bases for long periods, provision must be made to protect the surface. Curing seals are helpful in providing this protection, and in the more extreme cases consideration is given to the use of MC-2 instead of the emulsion generally specified. The greater penetration of MC-2 provides a better wearing course and lessens the surface abrasion. Where traffic must be carried throughout the winter over a base without the surface cover, it may be advisable to tailgate a ¾-inch to 1-inch mat of a bituminous mix material to serve as a temporary wearing course.

California began its first cement treatment of soils in 1921. The operation was slow in being adopted and it was not until 1938 that cement treatments were included on contract work. Today in California cement treatments have progressed to the point where it is unusual to review a set of plans without some type of cement stabilization.

Cement treatments offer the highway engineer the advantage of a base with increased supporting power and positive insurance against the bad effects of inadvertently including nonuniform base material. The use of increased cement must, of course, be balanced against the possible adverse effects resulting from loss of pavement flexibility.

Description of Projects

(1) Project 4.8 miles in length. Consisted of placing base and surfacing over previously constructed roadbed. New alignment with no public traffic. Surfaced with two inches of dense graded and one inch open graded bituminous plant mix.

(2) Project 4.3 miles in length. Consisted of constructing graded roadbeds for a divided highway with the necessary roadbeds for out highways and detours, and placing base and surfacing over a selected material. Traffic carried through project but not over lanes under construction. Surfaced

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REPRESENTATIVE UNIT BID PRICES ON RECENT PROJECTS

The contract	Cement treated base				Cement		Surfacing		
County Contractor	Thickness (inch)	How mixed (road mix or plant mix)	Quantities (sq. yd.)	Unit price	Cement (total barrels)	Price of cement (per barrel)	Top course	Curing seal	Class CTB
1 Mendocino Co., Granite Const. . .	4	Road	159,700	$0.20	13,960	$4.65	3" plant mix	Asphalt emulsion	A
2. Siskiyou Co., A. Teichert & Son . .	6	Road	124,000	.15	7,000	4.70	3" plant mix	Asphalt emulsion	B
3. Tehama Co , Rice Bros.	6	Road	120,000	.16	6,100	5.15	3" plant mix	Asphalt emulsion	B
4 Yolo Co., Ukropina-Polich & Kral	4	Road	108,000	.20	5,800	4.45	8" PCC	Ashalt emulsion	Cement treated subgrade
5. Marin Co., Guy F. Atkinson	8	Plant	17,500 (tons)	3.00 per ton	4,470	3.75	3" plant mix	Asphalt emulsion	A
6. San Mateo Co., Piombo Const	8	Road	233,000	.22	15,600	3.50	4" plant mix	Asphalt emulsion	B
7. Santa Barbara Co., Griffith Co.	4	Road	92,000	.19	3,500	4.30	8" PCC	MC-2	Cement treated subgrade
8. Ventura, Los Angeles, A Teichert & Son	8	Road	200,000	.20	18,500	4.50	4" plant mix	Asphalt emulsion	4" of A & 4" of B
9 Riverside Co., Robert Parker Co.	6	Road	71,000	.20	2,900	5.00	3" plant mix	None	C

* Does not include cost of cement.

† Quantity may also include cement for other purposes.

Aluminum Falsework

Is Used on Richmond-San Rafael Bridge

By FRANCIS J. MURPHY, C.E.*

A CONTRACT in the amount of approximately $25,000,000 for the construction of the superstructure of the Richmond-San Rafael Bridge was recently awarded to Judson Pacific-Murphy-Kiewit, a joint venture consisting of the Judson Pacific-Murphy Corporation of Emeryville, California; Peter Kiewit Sons' Company of Omaha, Nebraska; Stolte, Inc., of Oakland, California, and the Fred J. Early, Jr., Company of San Francisco, California.

* NOTE: Francis J. Murphy received his B.S. in Civil Engineering at the University of Santa Clara. He is an associate member of the ASCE and project manager on the superstructure contract of the Richmond-San Rafael Bridge. A registered engineer in the State of California, Mr. Murphy has been employed by the Judson Pacific-Murphy Corporation since its formation in 1945.

The bridge is 4.01 miles long and, when completed, will be the second longest over-water bridge in the world; the longest being the San Francisco-Oakland Bay Bridge, and the third longest being the recently completed Chesapeake Bay Bridge. The new span is being built under the direct supervision of Norman C. Raab, Projects Engineer of the Division of San Francisco Bay Toll Crossings.

New Developments

There are many new developments being used by the contractors in the construction of this job. One of the most noteworthy, and the one we shall dwell upon in this article, is the use of structural aluminum for falsework. It is believed that this is the first such use of aluminum in construction history.

The job is composed of 36 100-foot girder spans, two cantilever spans having identical anchor spans of 537.5 feet with main span clearance of 1,070 feet, and 36 289-foot truss spans. The aluminum falsework is being used for the erection of 27 of the 36 289-foot spans. The remaining nine 289-foot truss spans have been floated into place in one piece because the bottom chord elevation was low enough so that the use of aluminum was not necessary.

Method of Erection

The aluminum span as shown in *Figure 1* was fabricated in Judson Pacific-Murphy Corporation's plant in Emeryville and riveted and assembled

Aluminum falsework truss being towed to bridge

by joint venture personnel at its Richmond yard. It was then raised by two conventional derrick barges onto two Army surplus BK barges and floated out to the jobsite. It was then raised into position and supported by vertical wooden timber bents attached to the existing steel towers and, after erection, it forms a falsework platform. The wooden towers can be seen at either end of the aluminum span in *Figure 2.* The span will support the individual members of the truss span until it is finally swung into place and literally becomes a bridge.

Figure 3 shows a view of the aluminum truss before the steel erection is started. This truss is 285 feet long, 42 feet wide and 42 feet deep and weighs 110 tons. A similar truss made of steel would weigh approximately 330 tons and could not be handled by conventional hoisting equipment.

Figure 4 shows steel erection using a double-boomed erection traveler with the aluminum span as falsework. These aluminum spans cost approximately $150,000 each, and are one of the largest applications of structural aluminum in history. The only larger applications, tonnage-wise, are an arch-type bridge in Canada and the Alcoa Building in Pittsburgh.

FRANCIS J. MURPHY

Steel Rivets Used

Channels up to 12 inches, plate up to three-quarters of an inch, and angles to five-eighths of an inch were rolled at Alcoa's Massena, New York, mill and constituted 90 percent of the tonnage. The largest individual sections of the aluminum truss built up on plates and angles have a cross section of 27¾ inches x 19 inches. The heavy sections and long lengths required the limits of the Massena mill, one of the largest aluminum mills in the world.

Steel rivets were used in the aluminum assembly since they were more readily available and easier to heat and drive.

The firm of Earl and Wright, San Francisco was engaged by the contractors as consultants on this job, and thy have certainly performed remarkably well. In designing the aluminum, they followed closely the "Specifications for Heavy Duty Structures of High-Strength Aluminum Alloy" published as paper No. 2532 in Volume 117 (1952) of the Transac-

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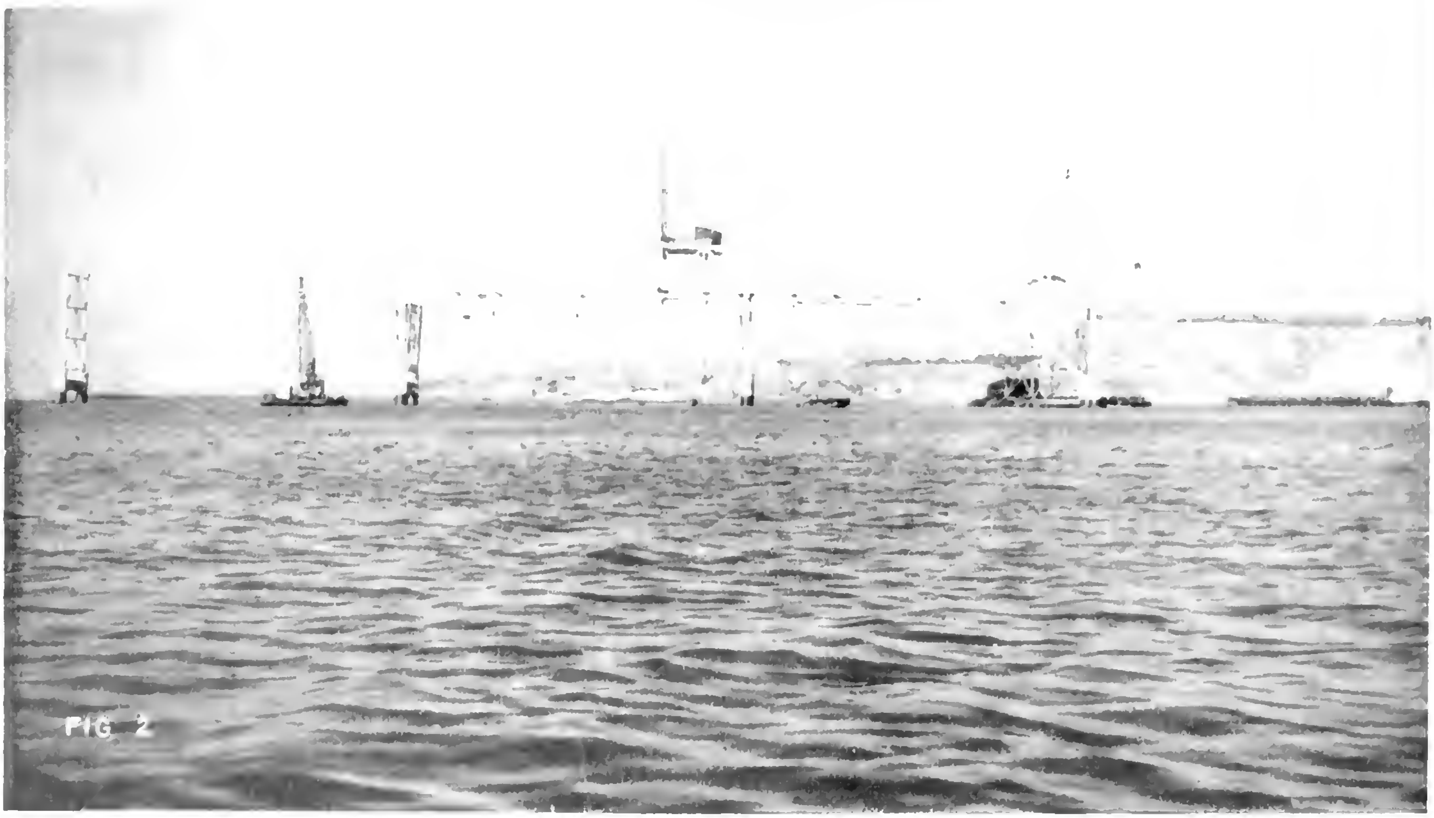
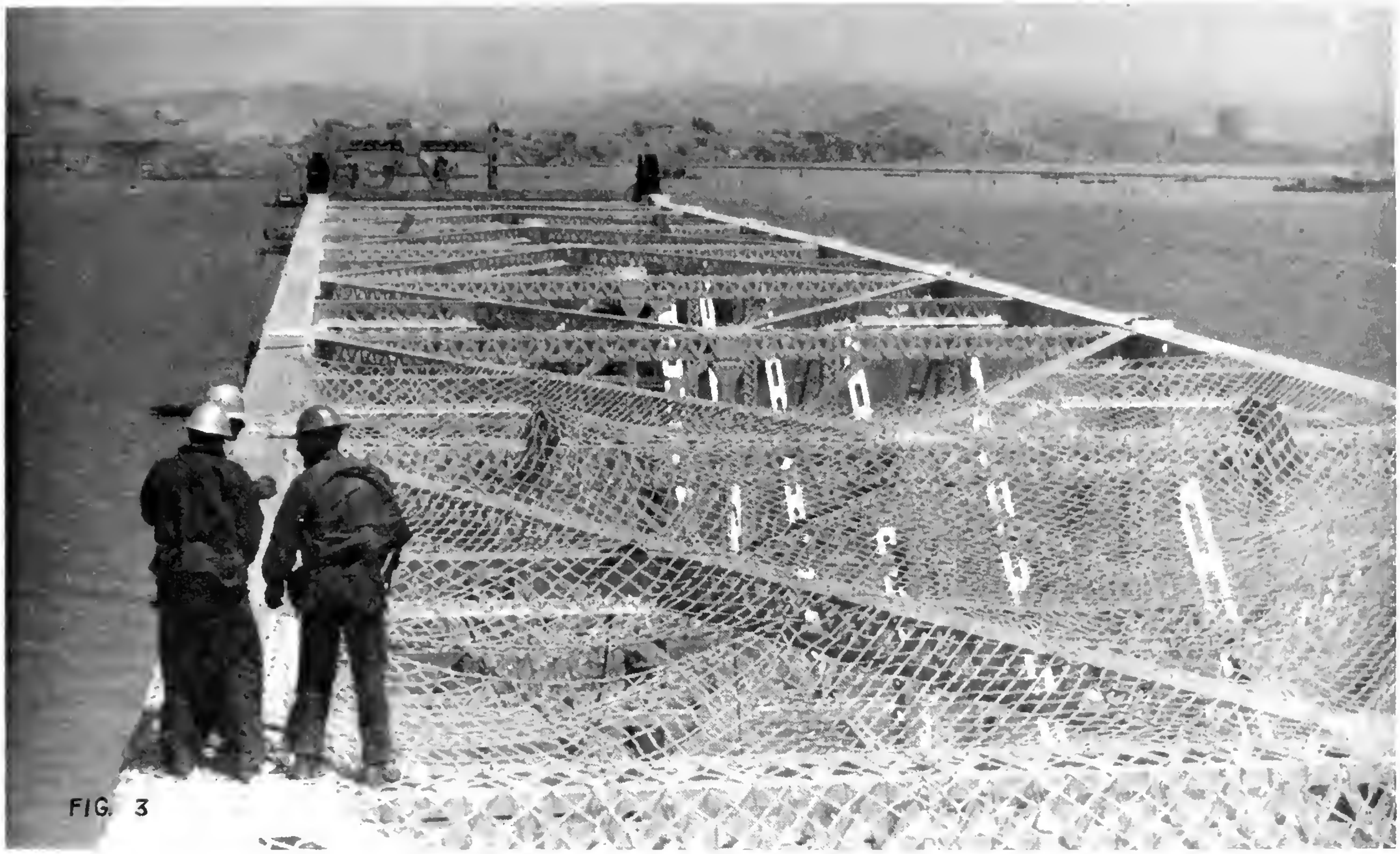
Aluminum falsework truss supporting erection traveler





Spreading safety nets on the aluminum span

DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

Status of work under contract for the Richmond-San Rafael Bridge project as of April 30, 1955:

Contract No. 1002A—Borings, $62,000. Awarded February, 1952. Completed July, 1952.

Contract No. 1003—Substructure, $14,500,000. Awarded February, 1953. Completion October, 1955. Status—99 percent complete.

Contract No. 1004D—Superstructure, $21,000,000. Awarded February, 1953. Completion October, 1956. Status—69 percent complete.

Contract No. 1005—Mole Fill, $248,000. Awarded May, 1953. Completed December, 1953.

Contract No. 1007—Trestle Approach, $192,000. Awarded September, 1953. Completed August, 1954.

Contract No. 1008—Richmond Approach, $741,000. Awarded December, 1954. Completion March, 1956. Status—29 percent complete.

Contract No. 1009—San Rafael Approach, $216,000. Awarded March, 1954. Completed November, 1954.

Contract No. 1010—Buildings and Toll Plaza, $290,000. Awarded August, 1954. Completion August, 1955. Status—61 percent complete.

Contract No. 1011—Electrical Work, $1,000,000. Awarded December, 1953. Completion August, 1956. Status—20 percent complete.

Contract No. 1012—Toll Collection Equipment, $280,000. Awarded September, 1954. Completion May, 1956. Status—10 percent complete.

Contract No. 1015—Separation Structures, $610,000. Awarded August, 1954. Completion November, 1955. Status—30 percent complete.

Status of the work on the entire project is 70 percent complete.

Director of Public Works, Frank B. Durkee, on May 12 awarded the last major construction contract on the project as originally planned. Paving of the lower deck of the structure will follow as a separate contract.

The contract awarded went to J. H. Pomeroy & Co., Inc., San Francisco, in the amount of $844,344.40 for the construction of eight reinforced concrete piers on steel piles at pier locations, the erection of 17 structural spans and the erection of 11 structural spans at pier locations in Contra Costa and Marin Counties.

Coincidentally Durkee authorized the Division of San Francisco Bay Toll Crossing to advertise for bids for grading and paving the Richmond toll plaza and approach roads for the bridge and grading and paving the yard area of the San Rafael Maintenance Building and constructing a separation. This work is estimated to cost in excess of $400,000 and with the Pomeroy contract is to be financed from the $50,000,000 construction fund set up under the $62,000,000 issue of Series A bonds, Richmond-San Rafael Bridge Toll Bridge Revenue Bonds.

Retirements *from* Service

John H. Obermuller

John H. Obermuller, Assistant Planning Engineer of the Division of Highways, retired on May 1st after 27 years with the State and a career of nearly 50 years in engineering work.

JOHN H. OBERMULLER

Obermuller was born in Hayward, California, and attended school there. His first engineering job was with the Western Pacific Railroad on the Feather River location project in 1906. He came to work for the State of California in 1928.

As Assistant Planning Engineer of the division, the position he held at his retirement, he has performed important liaison work between the Division of Highways and other agencies. Because of his engineering and administrative experience with other government and private agencies before coming to work for the State, he was assigned the responsibility of working out many of the now estab-

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Margaret Kenyon

Margaret Kenyon, Supervising Clerk II in the State Division of Highways Planning Department, retired on May 1st after more than 20 years in state service.

She was the guest of honor at a dinner given by her fellow employees on April 27th at the University Club.

MARGARET KENYON

Mrs. Kenyon came to work for the Maintenance Department of the Division in October, 1934, on a temporary two weeks appointment as a stenographer-clerk to help in the preparation of the California Highway Transportation Survey of that year, one of the forerunners of present day highway traffic studies. She has been with the division ever since, rising through the civil service ranks to become Supervisor of the Planning Department files.

When the Traffic Department, then known as the Safety Department, was formed in 1938, she was one of four employees making up the personnel of this new unit.

As supervisor in charge of the Planning Department records, she had charge of setting up the Planning Library, as well as working out many of the filing and recording procedures now in use by the division. She also took part in developing the forms now used in accident analysis by the Traffic Department. She has also aided in the compilation of many of the subsequent reports prepared in whole or in part by the Planning Department.

Mrs. Kenyon was born in Clayton, Missouri, and came to California in 1907. She has a son and a daughter and three grandchildren.

After retiring from state service, she plans to go into newspaper circulation promotional work.

Leo J. McCarthy, Sr.

The retirement of Leo J. McCarthy, Sr., for the past three years Property Disposal Agent and Auctioneer for the Excess Land Section of the Division of Highways in District VII, became effective the early part of April.

LEO J. McCARTHY, SR.

Mr. McCarthy is a native son, having the distinction of being born in San Francisco. Until 1935 he lived most of his life in and around the northern city, having graduated from schools and colleges in San Francisco and Oakland. His crisp, incisive speech still suggests the invigorating tang of salt air from his beloved northern coast.

He graduated from Sacred Heart College in San Francisco in 1904 and received a bachelor of arts degree from Saint Mary's College in Oakland in 1906. At Saint Mary's he also received a solid gold medal for oratory, attesting his brilliant performance in this field.

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JOHN F. OBERMULLER

Continued from page 48 . . .

ished procedures used in drawing up agreements between outside agencies and the State of California involving highway improvement and relocation.

Before reorganization of the division to handle the augmented construction program made possible by 1947 legislation, Obermuller was principal assistant to the Engineer of Surveys and Plans, with responsibility for review of all planning. The increased volume of highway construction and long-range planning resulting from the Collier-Burns Act of 1947 required full time assignment of Obermuller to interagency engineering liaison.

In addition to working on the Feather River railroad location project, his prestate experience also included seven years in Canada as resident engineer with the Grand Trunk Pacific Railroad, laying out the railway between Prince Rupert and Fraser Lake; two years as Assistant City Engineer of San Francisco supervising the location and construction of roads on the Hetch-Hetchy project; and 10 years with the U. S. Bureau of Public Roads.

As an engineer with the B. P. R., Obermuller had charge of much of the planning, location and construction work throughout the State under the forest highway program.

Obermuller lives at 716 34th Street in Sacramento. He is married and has one son, John C., an Assistant Construction Engineer with the Division of Highways, and three grandchildren.

He intends to spend his time after retirement traveling, working on his ranch in Nevada County, and doing some engineering consulting work.

He also will devote some time to perfecting his "camera-gun," a camera which he has set on the end of rifle stock and which can be set off by pressure on a trigger fastened to the camera shutter release by a length of taut piano wire.

By using his "gun," Obermuller says that he has all the pleasure of stalking an animal without having to kill it. By referring to a certain spot on each developed film he can tell whether a bullet would have struck the animal or not and where.

Obermuller has even stalked animals with his "gun" in national parks, although not without causing a certain amount of dismay at first to park rangers watching him through field glasses until they could reach him and find out what he was up to.

LEO J. McCARTHY, SR.

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To enumerate briefly the various high spots of his eventful career: He has been superintendent of streets for the City of Oakland; secretary and managing director of the National Catholic Welfare Council in San Francisco; realtor and appraiser in Oakland; field secretary to Most Reverend Edward J. Hanna, D.D., Archbishop of San Francisco; Assistant District Right of Way Agent in District IV; Assistant Chief Right of Way Agent, Legal Department, California Highway Commission; appraiser for the Federal Land Bank of Berkeley; broker, general real estate and insurance, and appraiser, referee and trustee for the Superior Court of Alameda County.

He came to District VII, Division of Highways, as a Right of Way Agent January 2, 1935, and on January 26, 1937, was appointed a district right of way agent, a title he held until he retired. In these latter positions he has had remarkable success in acquiring for the State unusually large parcels of land from prominent land owners, particularly in Ventura County.

He has been married over 40 years to the very gracious and lovely lady who shares his joys and sorrows, Mrs. Loretta McCarthy. They have five children and 10 grandchildren—a regal family of which they are justly proud.

From 1919 to 1920 he was Master of the Fourth Degree (highest degree in the Order of the Knights of Columbus) of Northern California and Nevada, and now holds title of Past Master.

He is a past president (1943) and charter member of the American Right of Way Association, Chapter No. 1, and a member of CSEA, Highway 101 chapter.

His hobbies are fishing—any time or place—and debating with Frank C. Balfour on the relative merits of the two great Catholic universities, Saint Mary's and Santa Clara.

Three Veterans Of Highways Are Retiring

Three veteran Division of Highways maintenance foremen, whose combined service with the State totals 99 years, are retiring.

They are Lester C. Harmon and L. Ernest Roy, who retired on May 1st, and Leo W. Sackett, scheduled to retire at the end of July.

All three men have served with District III (Marysville) during the latter part of their careers.

Harmon came to work for the division in 1921 as an operator of heavy trucks and tractors. He became subforeman in 1925, and was promoted to foreman in 1932. He has worked in District X (Stockton) and District IX (Bishop), transferring to District III in 1936 where he worked until his retirement. Since 1937 he has served as foreman in the Roseville area.

Roy was first employed by the division in District X in 1929. After a short assignment to District IX between 1936 and 1937 he transferred to District III as foreman in the Georgetown area. He was later transferred to El Dorado, where he now resides.

Sackett started to work for the division in 1916 driving a six-horse team on the old road between El Dorado and Placerville. In 1924 he operated one of the first motor graders bought by the State. Three years later he became maintenance foreman at Camp Pyramid, 40 miles east of Placerville, later transferring to Placerville where he remained until 1937. After a two-year assignment in Marysville, he was transferred to the Sacramento territory where he has worked for the past 19 years.

Harmon and Sackett are native Californians, Harmon being born in Jackson, Amador County, Sackett in El Dorado. Roy was born in Black Hawk, Colorado.

All three men intend to spend a lot of their time hunting and fishing after their retirement.

ALUMINUM FALSEWORK

Continued from page 46 . . .

tions of the American Society of Civil Engineers.

Highest Strength Aluminum Alloy

These specifications were drawn up for the highest strength aluminum alloy (14S-T6), formed by alloying copper and other light metals with aluminum followed by heat-treating. According to these specifications, the following factors in structural aluminum design are important:

Basic allowable tensile working stress is 22,000 psi based on minimum yield strength of 53,000 psi and minimum tensile strength of 60,000 psi.

Modulus of elasticity in tension and compression is 10,600,000 psi (this compares with 30,000,000 psi for steel).

Coefficient of expansion is 0.000012 per degree (double the 0.0000065 per degree F. of steel).

Weight is 0.10 pci (steel is 0.28 pci).

Aluminum structures must be protected by paint, although alloying aluminum reduces resistance to corrosion. The fabricated members are first given a thorough cleaning with a mild phosphoric acid solution. This is followed by a prime coat of zinc chromate. Finish coat for the erected spans is an aluminum pigmented paint.

The major reasons for the contractors using aluminum as falsework are:

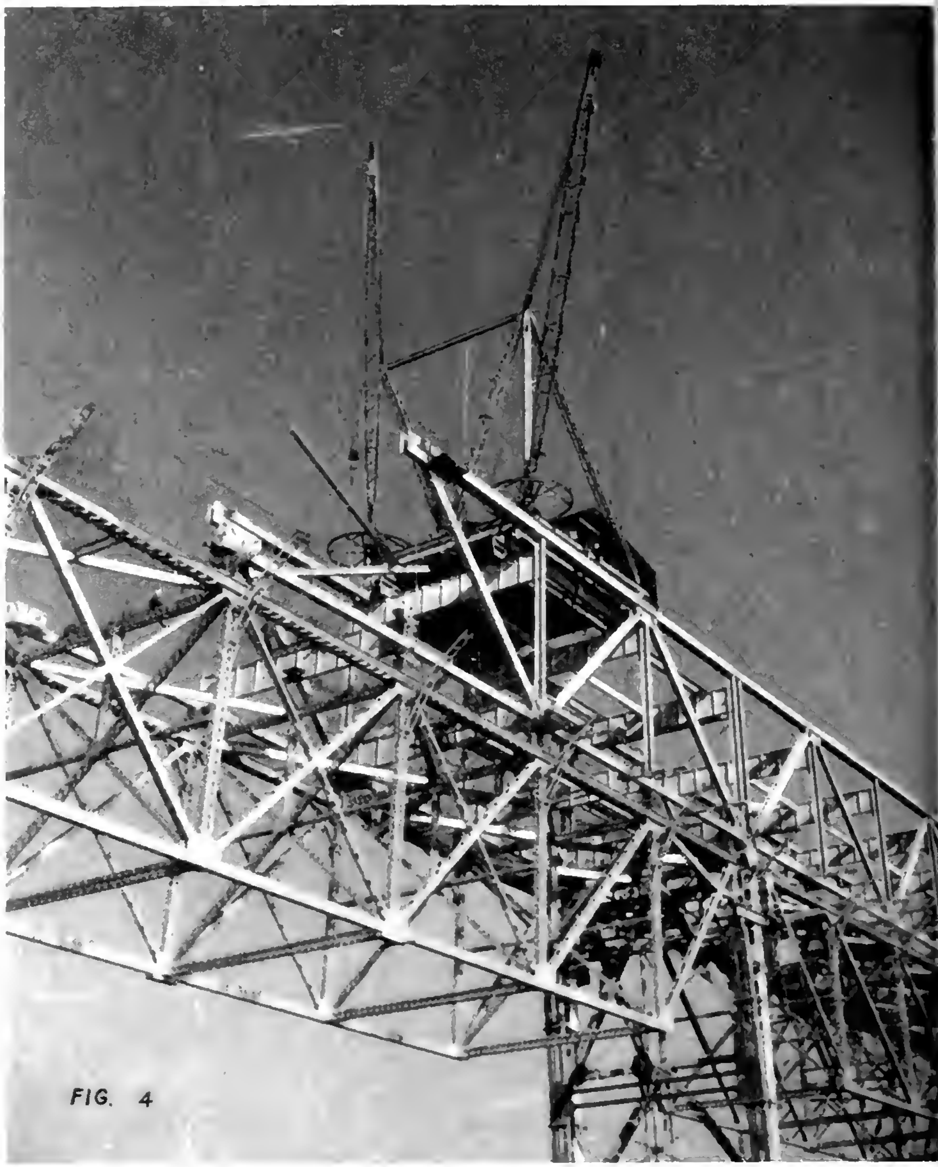
1. It eliminated the use of conventional falsework piling for the 27 spans which, due to the location and height of the bridge, and because of the depth of water and mud (down to minus 200 feet in some places) would prove extremely expensive.

2. The fact that the bridge was designed with 36 typical 289-foot truss spans made it advantageous to use a falsework system that would allow repetition of operation.

3. The aluminum span is covered with a safety net, and the contractors feel that this is one of the safest methods of bridge construction ever devised.

Construction on Schedule

The Richmond-San Rafael Bridge was designed by the Division of San Francisco Bay Toll Crossings under the direction of Norman C. Raab. The engineers for the Judson Pacific-Murphy-Kiewit joint venture who actually designed the aluminum falsework are Earl and Wright of San Francisco.



Double-boomed traveler setting steel

Construction of this huge project is on schedule, and it is estimated that the bridge will be complete and ready for traffic late in 1956.

PLEASED WITH FREEWAYS

SUPPLEE-WILLS-JONES MILK COMPANY
Lincoln-Liberty Bldg.
Philadelphia 7, Pa.

HIGHWAY COMMISSION
Sacramento, California

GENTLEMEN: I had occasion to visit Los Angeles recently and had the pleasure, I might add, extreme pleasure, of riding on your new wonderful freeways in that area. I had been in Los Angeles some four years ago when the freeways were just being started. In the meantime, I had heard here in the east, a lot of newspaper talk about traffic congestion in Los Angeles. I certainly will say that you people have it pretty well licked with your freeways. I want to add my congratulations to the vast number I know you must already have received.

Very truly yours,

SUPPLEE-WILLS-JONES MILK CO.
D. J. CRUMLISH,
Chief Engineer

CEMENT TREATED BASES

Continued from page 44 . . .

with three inches of dense graded bituminous plant-mixed surfacing.

(3) Project 7.23 miles in length. Consisted of placing base materials on portions, of scarifying and breaking up the existing base and surfacing, and of mixing the broken material with cement and recompacting and placing three inches of bituminous plant-mixed surfacing thereon. Traffic had access to working areas.

(4) Project 4.0 miles in length. Consisted of placing base materials and eight inches of PCC pavement over previously constructed roadbed and of resurfacing existing highway with bituminous plant-mixed surfacing. Cement treatment and paving operations were on new alignment and experienced little interference from traffic.

(5) Project 4.0 miles in length. Consisted of grading a six-lane divided roadway, constructing tunnel and other structures, and of placing base materials and surfacing over a portion of the project.

(6) Project 5.0 miles in length. Consisted of constructing a graded roadbed for a divided highway with the necessary roadbeds for outer highways and ramps, and of placing base materials and bituminous plant-mixed surfacing. Some traffic interference to the construction operations.

(7) Project 3.4 miles in length. Consisted of placing base materials and eight inches of PCC pavement over a previously constructed roadbed. New alignment with little traffic interference to cement treatment and paving operations.

(8) Project 12.3 miles in length. Consisted of constructing a graded roadbed and of placing base materials and bituminous plant-mixed surfacing, both over base materials and existing pavement. Some traffic interference to the construction operations.

(9) Project 4.8 miles in length. Consisted of grading and surfacing an additional roadbed with plant-mixed surfacing on cement treated base, and resurfacing existing pavement with plant-mixed surfacing, to provide a four-lane divided highway. Construction of frontage roads and connections also included. No traffic interference to construction operations.

MANY RACES MAN HIGHWAY OFFICES

MELTING POT—Cass M. Rose, senior highway engineer, leans on table in Substructure and Minor Contracts Section of State Division of Highways in Los Angeles. Surrounding him are workers of many racial origins. From left, (1) Tim Leong, Chinese; (2) Andres Passivo, Italian; (3) Robert A. Ryan, Irish; (4) Aurora Adajian, Armenian; (5) Sumiko Fujimoto, Hawaiian-Japanese; (6) Mona Sanchez, Mexican; (7) Louis E. Glick, Jewish; (8) Michiko Omori, Japanese; (9) Robert Cauderc, French; (10) Morton Rabinowitz, Jewish; (11) Frank Pleska, Czech—all of them Californians. Because of the many nationalities office is known as melting pot. Los Angeles Times photo.

You won't find a more interesting office than the Substructure and Minor Contracts Section of the State Division of Highways in Los Angeles.

For two reasons:

(1) The work they do, and (2) the people who do it.

This office, located on the fifth floor of the Tishman Building, 3460 Wilshire Boulevard, is a vertible "engineering melting pot."

Among its 32 employees are represented no less than 14 nationalities, four different races, and five basic religions.

Only One of Kind

Headed by Cass M. Rose, a senior highway engineer, the office is unique and comparatively new. It was established little more than two years ago. And it is the only one of its kind in the entire State Division of Highways. It gains additional distinction by being sort of an "earn while you learn" training school.

Its principal functions—as you might surmise from its title—are to map and catalogue all underground facilities so that highway engineers excavating for a freeway or a bridge won't encounter any surprises, and to prepare specifications for minor contracts that may range from little $250 jobs to $25,000 projects.

Fourteen Nationalities

As to the office's aspect as a Little United Nations—well, when you walk in, you're greeted by a petite Japanese girl or an attractive Mexican senorita at the front desk. In the file room, where there are some 200,000 prints on file, you can get data on underground lines from a Greek or an Irishman. Go into the drafting room and you'll find an Italian helping an Armenian girl plot a map. At an adjoining table, a Chinese and a Hebrew are discussing a right of way. And, at other drafting tables, you'll find a Frenchman, Dutchman, a pretty Hawaiian-Japanese girl with a flower in her hair, a Swede, a Pole, an Englishman, and, believe it or not, just plain Americans. All of them, of course, are American citizens—and proudly Californian.

—Art Ryon in Los Angeles Times

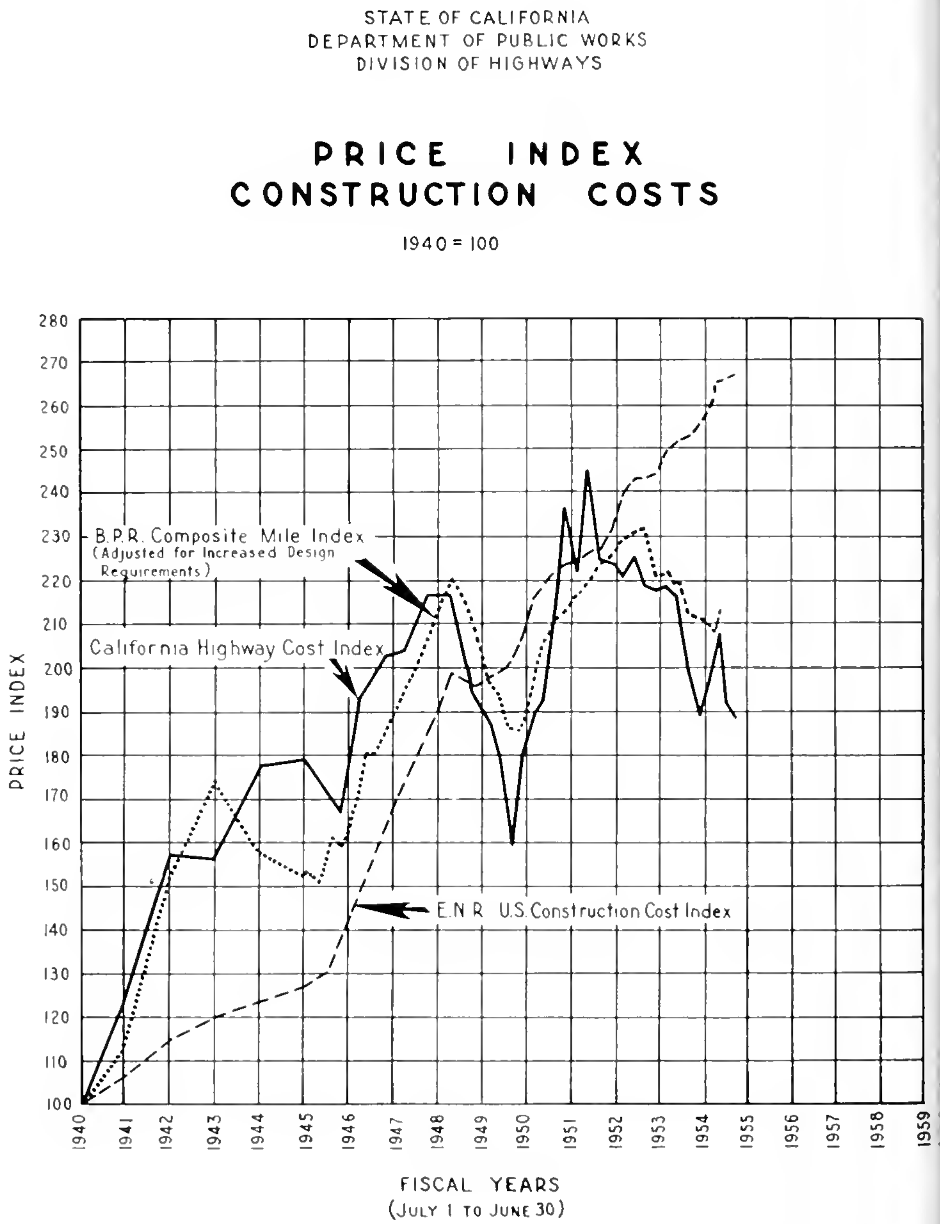
Cost Index

Little Change in Construction Costs During First Quarter 1955

By RICHARD H. WILSON, Assistant State Highway Engineer;
H. C. McCARTY, Office Engineer;
JOHN D. GALLAGHER, Assistant Office Engineer

During the first quarter of 1955 state highway construction costs were down 1.5 percent from the fourth quarter of 1954 as indicated by the California Highway Construction Cost Index. The Index stands at 189.3 (1940 = 100) for the first quarter of 1955 which is 2.9 points below the 192.2 of the fourth quarter of 1954.

Examination of the accompanying tabulation of the Highway Cost Index, from 1940 on, indicates that during 1954 and the first quarter of 1955 construction costs have fallen back to the approximate levels of 1950 and at the present are more or less stationary. How long this stationary condition in the levels of bid prices can hold in the face of increasing materials cost, equipment prices and labor rates is a matter of conjecture. To quote the March 3, 1955, issue of the *Engineering News-Record* in commenting on continued low bid prices in the face of rising costs:



THE CALIFORNIA HIGHWAY CONSTRUCTION COST INDEX

Year	Cost index
1940	100.0
1941	125.0
1942	157.5
1943	156.4
1944	177.8
1945	179.5
1946	179.7
1947	203.3
1948	216.6
1949	190.7
1950 (1st quarter)	160.6
1950 (2d quarter)	180.0
1950 (3d quarter)	189.2
1950 (4th quarter)	194.8
1951 (1st quarter)	215.4
1951 (2d quarter)	238.3
1951 (3d quarter)	221.9
1951 (4th quarter)	245.4
1952 (1st quarter)	224.8
1952 (2d quarter)	224.4
1952 (3d quarter)	221.2
1952 (4th quarter)	226.2
1953 (1st quarter)	218.3
1953 (2d quarter)	217.5
1953 (3d quarter)	218.0
1953 (4th quarter)	216.7
1954 (1st quarter)	199.4
1954 (2d quarter)	189.0
1954 (3d quarter)	207.8
1954 (4th quarter)	192.2
1955 (1st quarter)	189.3

"contractors have already squeezed a lot of productivity and profit-trimming into their bids."—"Contractors cannot continue to absorb materials price increases and higher labor costs. They've already used up many of their opportunities for cutting their costs."

These comments confirm the opinions which this department has been expressing in these quarterly releases on highway construction costs during the past year. Such costs must start an upward trend to follow the increases in labor rates and materials costs.

As stated in our January, 1955, release, the currently high number of large highway contracts in California involving large quantities of work and materials coupled with the continued keen competition among bidders does have a marked effect in holding down unit prices. Nevertheless it is still the opinion of this department that bid prices will begin a steady rise in the near future.

As a gauge to the current volume of state highway construction in California, it is noted that on April 1st the Division of Highways had under way 309 contracts with a total contract value of $221,283,700.

Inspection of the average unit prices bid during the first quarter of 1955 for the eight principle items upon which California Highway Construction Cost Index is based (see accompanying tabulation) show a marked increase in the average unit price for roadway excavation, this rise was 17.1 percent over the average for the fourth quarter of 1954. Portland cement concrete pavement rose 2.3 percent; bar reinforcing steel was up 1.1 percent; and structural steel increased 3.6 percent during the quarter. These increases were not sufficient to raise the over-all Index, the decreases of 11.7 percent in structural concrete, 5.8 percent in plant-mixed surfacing and 5.1 percent in untreated rock base were enough to lower the Index 1.5 percent. However, these four items up and three items down would almost presume the static condition of construction costs as indicated by the Index for the fourth quarter of 1954 and the first quarter of 1955.

The accompanying chart, showing the California Highway Construction Cost Index, the *Engineering News-Record* Construction Cost Index and the United States Bureau of Public Roads Composite Mile Index compares these three Indexes, all reduced to the 1940 = 100 base.

The *Engineering News-Record* Construction Cost Index, which comprises all types of construction on a national scale and is computed on the basis of labor rates and materials prices, was up 0.4 percent in the first quarter of 1955 over the fourth quarter of 1954.

The U. S. Bureau of Public Road Composite Mile Index, which, while nation-wide in scope is computed on the basis of actual average bid prices (as is the California Index), was up 2.2 percent for the fourth quarter of 1954 over the third quarter.

In comparing the three Indexes it may be noted that in the California Index, computed from a smaller base, the effects of local conditions of individual projects are more pronounced, while broad national base of the other two Indexes produce smoother curves. The U. S. Bureau of Public Roads Composite Mile Index and the California Highway Construction Cost Index, both being based only on highway contracts, more or less follow each other while the *Engineering News-Record* Index including all types of construction shows considerable variance from those two.

CALIFORNIA DIVISION OF HIGHWAYS AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Crusher run base, per ton	Plant mix surfacing, per ton	Asphalt concrete pavement, per ton	PCC pavement per cu. yd.	PCC structures, per cu. yd.	Bar reinforcing steel, per lb.	Structural steel, per lb.
1940	$0.22	$1.54	$2.19	$2.97	$7.68	$18.33	$0.040	$0.083
1941	0.26	2.31	2.84	3.18	7.54	23.31	0.053	0.107
1942	0.35	2.81	4.02	4.16	9.62	29.48	0.073	0.103
1943	0.42	2.26	3.71	4.76	11.48	31.76	0.059	0.080
1944	0.50	2.45	4.10	4.50	10.46	31.99	0.054	0.132
1945	0.51	2.42	4.20	4.88	10.90	37.20	0.059	0.102
1946	0.41	2.45	4.00	4.68	9.48	37.38	0.060	0.099
1947	0.46	2.42	4.32	5.38	12.38	48.44	0.080	0.138
1948	0.55	2.43	4.30	5.38	13.04	49.86	0.092	0.126
1949	0.49	2.67	4.67	4.64	12.28	48.67	0.096	0.117
1st quarter 1950	0.34	2.22	3.65	3.74		40.15	0.077	0.081
2d quarter 1950	0.40	2.13	4.48	3.74	10.86	43.03	0.080	0.105
3d quarter 1950	0.41	2.32	4.25	5.50	10.91	44.34	0.093	0.131
4th quarter 1950	0.42	2.81	4.64	4.61	12.55	43.18	0.098	0.120
1st quarter 1951	0.45	3.07	4.06	5.22	11.71	46.38	0.103	0.206
2d quarter 1951	0.63	3.88	4.56	4.63	12.93	51.50	0.105	0.166
3d quarter 1951	0.56	2.88	4.59	3.90	12.41	46.14	0.107	0.165
4th quarter 1951	0.66	2.91	5.66	4.89	12.71	49.38	0.105	0.169
1st quarter 1952	0.56	3.25	4.88	4.77	14.25	47.46	0.094	0.152
2d quarter 1952	0.53	3.19	5.29	4.13	14.20	49.12	0.091	0.143
3d quarter 1952	0.55	2.61	5.49	4.60	12.80	48.21	0.094	0.132
4th quarter 1952	0.66	2.68	4.97	....	12.53	48.45	0.094	0.128
1st quarter 1953	0.45	*2.48	5.27	4.46	12.47	53.19	0.098	0.150
2d quarter 1953	0.50	2.07	5.38	4.59	13.06	52.68	0.091	0.132
3d quarter 1953	0.54	2.15	5.30	4.82	13.78	49.23	0.092	0.129
4th quarter 1953	0.48	2.11	4.74	4.47	14.77	53.41	0.105	0.139
1st quarter 1954	0.45	2.28	4.23	4.78	14.89	47.52	0.092	0.126
2d quarter 1954	0.38	2.09	4.29	5.18	14.28	47.12	0.093	0.114
3d quarter 1954	0.43	1.85	4.68	7.00	12.63	49.59	0.095	0.162
4th quarter 1954	0.35	1.78	4.83	....	13.13	46.08	0.094	0.135
1st quarter 1955	0.39	1.69	4.55	....	13.44	40.66	0.095	0.140

* Untreated rock base substituted for crusher run base at this point.

AIR PHOTOS HELPFUL

Time, money and engineering manpower have been saved through extensive use of aerial photographs during the planning and design stage on practically all California highway projects involving new alignment. Contour maps obtained from air photos are used in about 50 percent of such projects.

Traffic Headaches

Engineers Plan Carefully in Advance to Avoid Them

By A. L. ELLIOTT, Bridge Engineer, Planning

ONE EARLY morning in Los Angeles recently, a linotype operator completed setting the type for the morning edition of a paper and started home. Crossing the Los Angeles River on Aliso Street at 4 o'clock in the morning, he found his way blocked and had to take a detour of several blocks around some bridge construction.

A little earlier the same night, a bartender closed up shop and started for home in Oakland. When he got to the distribution structure at the east end of the San Francisco-Oakland Bay Bridge, he also found his way blocked and had to detour several blocks to get around some bridge construction.

Each of these motorists was probably annoyed a little, but traffic was light and the delay of detouring was negligible and he too was soon home. Next morning however, when the morning rush surged onto the streets and impatiently elbowed its way to work, the roadways were running full. Traffic flowed like a never ending tide, and except for rare occasions, showed barely a ripple as it passed over temporary detours around the construction work.

Traffic Handling Planned

These incidents in widely separated parts of the State are in a way quite unrelated. In another very real way however, they are very closely related because they are both part of very carefully planned traffic handling operations on two large construction projects.

Every day about 1,000 persons come to California. Some come to visit. Many come to stay. With every two persons comes an automobile. All of these cars coming in, plus all of the cars already here—more than any other state in the Union—can only mean one thing: Traffic, lots of it—and congestion. These traffic jams all concentrate in the heavily populated areas. It follows very naturally then, that to relieve the congestion, there must be a lot of new construction in these heavily populated areas.

New construction usually adds to congestion for a time and, occasionally results in severe inconvenience for a few. As one public utility freely admits on its construction signs: "You can't have progress without inconvenience."

Matter of Understanding

If you are having your living room repainted, you don't expect to throw a party in the midst of the operation. If you are having a new stove installed in your kitchen this afternoon, you don't expect to have dinner as usual tonight—you'll probably have to eat out at the local beanery. You, as the occupant of your own house, understand these things. You put up with the inconvenience and step over the plumber's tools. You have a vision in your mind of how nice the new color scheme is going to look or how convenient it is going to be to cook on that new stove. However, when you as the occupant of your community, as the user of your streets and highways, come upon a highway remodeling operation, it's not always so easy to understand. Maybe the vision of better things to come is not so bright. Maybe the snail's pace gait and the jammed-in bumper of the car ahead of you hamper your broadmindedness.

Detours Important

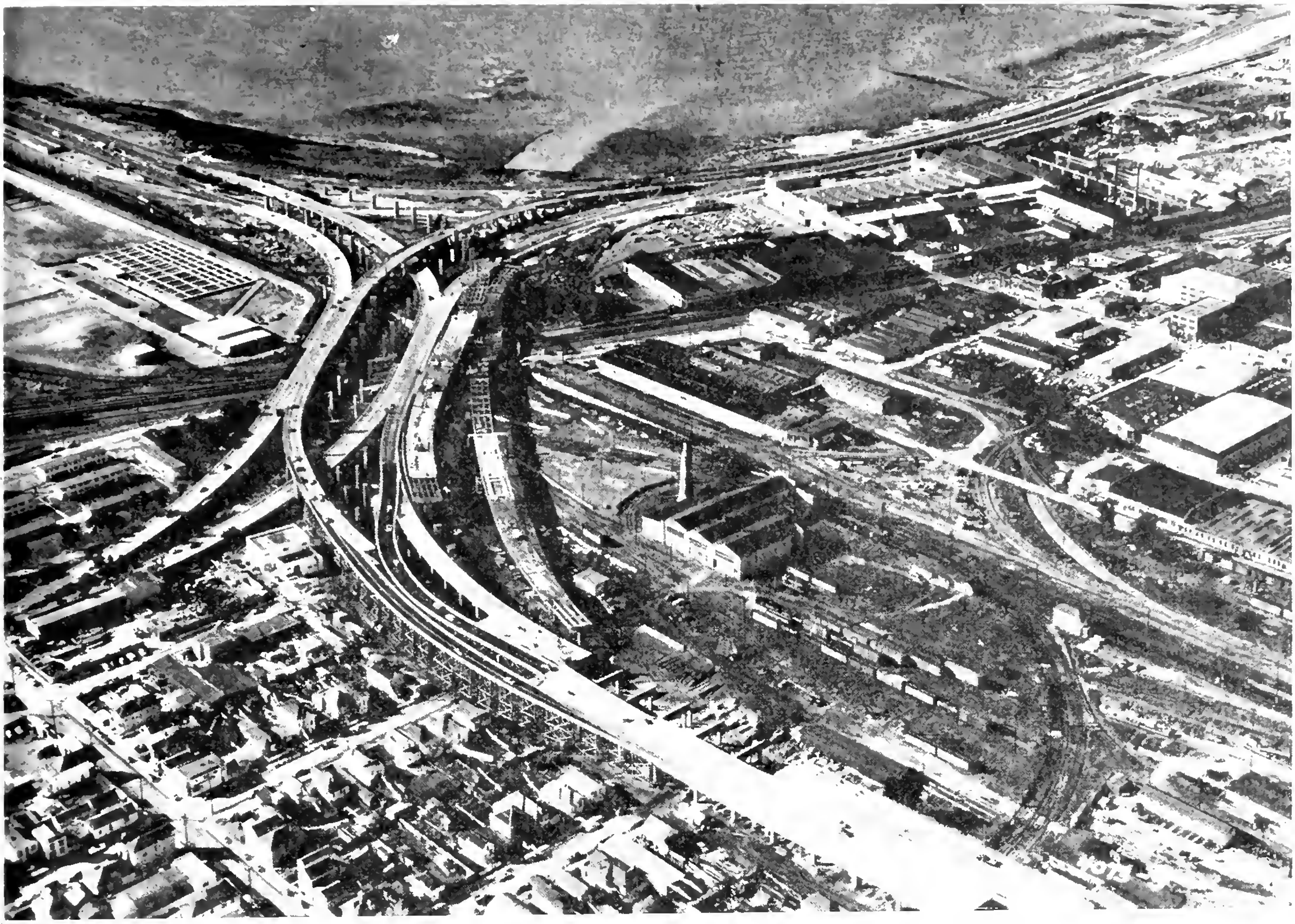
Throughout the State in every Division of Highways Office, this traffic problem is assuming greater and greater importance. Time was when detours were accepted as a normal part of highway travel. Detours in those days were often not very luxurious affairs either. In these days, with modern traffic, with as many as 165,000 cars streaming in an endless pouring torrent over one major artery in a 24-hour period—detours that impede traffic cannot be tolerated.

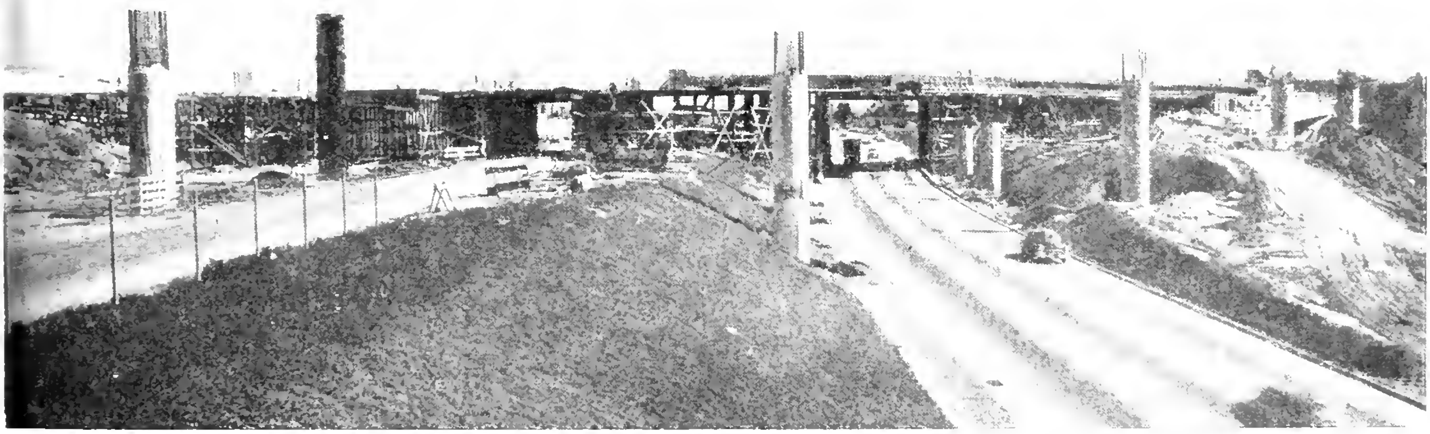
In the design of a structure or the planning of a complicated interchange, more time is often spent figuring out how to handle the traffic during construction than is spent figuring stresses and strains in the structure. Supports must be placed where they are back from the edges of the pavement. Roadways which will be in constant use must be kept free and unrestricted. The side clearances must be ample so that timid drivers will not slow down in apprehension and cause traffic jams which can back up for miles within a matter of minutes.

Temporary Bridges

Where structures must be built over busy streets, the members are designed to be erected in one piece and then, in the wee hours of some morning when the traffic is at its lowest ebb, the street will be closed for a few hours and the girders quickly hoisted into place. Later, when the flood tide again comes pouring to work, motorists find a new framework against the sky but underneath the roadway is clear and the traffic flows on.

Sometimes it is necessary to spend a great deal to build a temporary bridge just to carry traffic during construction. These "temporary" bridges are often respectable structures in their own right. When a new approach was built on the San Joaquin River bridge at Antioch, the bridge could not be closed for more than a few hours. Thousands of tons of tomatoes, asparagus, and other produce from the rich Delta region are trucked out over this bridge every season. To carry the never ending stream of trucks and automobiles a bypass structure was built nearly 100





UPPER—Aerial view of the $5,000,000 reconstruction job on the East Bay Distribution Structure in Oakland. In the foreground, traffic flows over the high timber trestle detours which were built around the points where portions of the old structure had to be removed and new connections made. LOWER—Construction underway on the interchange of the Long Beach and Santa Ana Freeways in East Los Angeles. Note the ample openings left for traffic, in background, and columns in foreground set well back from the roadway to give sufficient clearance as further structural work progresses.

feet above the river to carry the traffic from the main bridge onto the old approach until the new connection could be built. This high trestle was a sizeable structure in itself. Its cost of $80,000 was a material part of the $860,000 it cost to do the whole job.

Bay Bridge Project

Five million dollars are being spent on the distribution structure at the east end of the San Francisco-Oakland Bay Bridge to relieve the congestion and to sort the traffic out and send it out in the proper direction without the necessity of weaving in and out through lines of cars. Every day this structure carries over 130,000 vehicles. It would be out of the question to detour this traffic—no place to go. Equally impossible would be any plan to limit the number of lanes—to try to do the reconstruction part at a time. The only solution was to build a temporary bridge completely out and around the areas where roadways had to be torn out and new connections made. This temporary bridge cost $300,000. This is a large sum but, when you stand beside the roadway almost any time and watch the zoom—zoom—zoom of a car every two-thirds of a second on the average day and night—or when you see the actual miles of cars that pile up in a few minutes when even a minor accident occurs—then you realize full well that this traffic is not to be stopped. It should not even be slowed down. If $300,000 must be spent to keep it rolling while a $5,000,000 improvement is being made, then it is well worth the money.

Los Angeles River Bridge

Two sheets of the contract plans for the Los Angeles River bridge were used merely to show how the traffic would be handled. How small parts of the work had to be completed and traffic moved over before some other work could be done. It was all worked out in meticulous detail to make sure that there would always be a full roadway and that the cars would be kept rolling.

There is another factor that enters into our planning. When you hire a man to do a job, you don't get nearly as impatient if you see he is working hard all of the time. When you are paying his wages, you like to see him work. If you hire a plumber to install a new sink—he tears out the walls, he scatters his tools all over the floor, he messes up everything. You impatiently watch from a distance. You wish he'd hurry. It seems to take twice as long as it should. But, when you look in the kitchen and find everything still messed up and the plumber gone to finish up some other job he considered more urgent than yours, your righteous indignation really boils over—and probably showers all over the plumber and his boss. As occupants of your community, you feel the same about your highway work, and quite often with good justification.

This is a sample of the traffic on the Santa Ana Freeway in downtown Los Angeles, just west of the Aliso Street Bridge over the Los Angeles River, which must be carried with a minimum of delay through two major construction projects—the widening of the bridge and, just beyond it, the adding of a new ramp to the Santa Ana-San Bernardino Freeway interchange.

Typical Reaction

A contractor starts a new piece of freeway. He tears up the landscape. He digs ditches and scatters pipes along the right of way. Then maybe the work seems to drag. Maybe it even seems to stop. You impatiently ride along and you can't even find a single man working. And right there you become indignant. You write to your newspaper. Your newspaper writes editorials. Sometimes you write to us.

We get concerned about these delays too. We probably knew, even before you suspected it, that the job was dragging. Unfortunately, we are in the middle. When we find contractors inclined to drag their jobs or when we have a job we want to get finished in the shortest possible time, our only defense is to shorten the time limits and increase the penalties for not getting through on time. This we have done, and are doing more and more on the critical jobs.

Time Limits Set

In bold faced type in the specifications for an urgent job we tell the bidders that we have set a time limit which will require them to press the job to its utmost and maybe even work double shifts to get through on time. If they do not get through within the allotted time we have increased the penalty. For the Los Angeles River bridge on Aliso Street in the heart of Los Angeles and for the terminal separation structure in downtown San Francisco, the penalty was set at $500 for each day the contractor ran over the time limit set. Progress schedules are required for each portion of the work so that a dragging schedule can be nipped in the bud and hurried to make up for lost time.

This effort to keep the wheels rolling has paid off. As part of this effort, the Aliso Street bridge widening project which will correct one of Los Angeles' worst traffic headaches, was 70 percent complete when the time was only half gone. But more than that, there were no empty excavations. There were no detours around construction where nothing was happening. The dirt kept flying and almost any time that you chose to drive by you could see and hear parts of the structure rising into place—see men busily at work. And, though you may have been impatient, you understood and had greater patience. Our mail is lighter. Our phones do not ring for irate citizens to complain. We know you like to see the work being done rapidly.

Increased Program

There is much talk these days about an increased program. Whether any specific program now under consideration is adopted or not, it is obvious that the ever increasing number of cars on our highways will require a further step up in highway improvement schedules. What will it mean? It all adds up to more rush to get work under way, more pressure to get work completed sooner. Certainly, "business as usual" has gone out the window and will probably not return within the foreseeable future.

What will all this mean to our planning for handling traffic? It will become more important than ever. The congestion will be greater, the planning will have to be more careful. More money and effort will have to be expended to get traffic through the work without hindrance or delay. Contract times will be shortened even more to force contractors to get the work done in the minimum possible time so the period of inconvenience will be made as short as possible.

Oh yes, traffic will still pile up. There will be bottlenecks here and there, some honking horns and frayed tempers. But to those who, in the face of the inevitable cost of progress can relax and enjoy it, these things will be merely one more indication that in highways, like in most everything else, the future holds a store of wonderful things.

Old Timers May Remember These Strict Laws

Ever since the first horseless carriage started sputtering and roaring its way along our streets and highways back before the turn of the century, everyone from the embattled farmer to the indignant city father has been doing his darndest to write some laws that would curb the newfangled monster.

Perhaps the wildest of these laws, according to the National Automobile Club, were drawn up by the Anti-Automobile Society that was formed back in Pennsylvania when the problem was first coming to the fore. There the farmers decided that anyone driving a horseless carriage along the road at night should come to a stop every mile and send up a signal rocket, then wait 10 minutes for the road to clear. If a team of horses should approach along the road, the motorist was obliged to pull off the road and cover his vehicle with a large canvas or painted cloth that would blend with the surrounding landscape. If the horses refused to pass even then, the motorist had to take his vehicle apart piece by piece and hide the pieces under the nearest bush.

Speed Limit 12 Miles

The city fathers got around to having their little say, too. In Connecticut back in 1901 they passed the first speed law in the United States, setting it down in the book that no driver should drive faster than 12 miles per hour in the cities or faster than 15 miles per hour in the country. In Cleveland, Ohio, they passed a law against driving your car while you had someone on your lap. Out in Green Bay, Wisconsin, they got the idea that oil dropped from cars would damage their pavements, so they set a fine of $5 on every drop of oil. In Memphis, Tennessee, they made it unlawful for any motorist to drive while he was asleep, and out in Utah they wrote it down in their books of law that birds always have the right of way. And then, of course, there was the enigmatic sheriff who posted the sign that read: "The speed limit is a secret this year. Motorists breaking it will be fined $10."

This was the law and the horseless carriage!

El Camino Real

New Section of Divided Highway in Ventura County

By BRUCE A. GENTRY, Resident Engineer

LOCATED on the coast of Ventura County, whose fertile valleys were once the hunting grounds of the Chumash and Saticoy Indians, was a tiny fishing village which has since become known as the City of San Buenaventura (the City of Good Fortune). Four hundred and thirteen years ago, Juan Rodriguez Cabrillo landed on its beach in the course of his explorations. He was several days traveling, either by sea or overland, from the pueblo of Los Angeles, some 70 miles to the south. Today, he could step from his longboat into an automobile and be in the neighboring metropolis in an hour. The old conquistador would undoubtedly be impressed as he traveled through beautifully cultivated farms and orchards, dotted with modern ranch houses and homes. He would be following a trail that once led Fra Junipero Serra between his missions, later becoming the El Camino Real that carried stagecoaches through country dominated by the outlaw, Joaquin Murietta. This road is now known as Ventura Boulevard, U. S. Highway 101, another important unit of which has just been improved to a four-lane divided, limited access highway.

Four Lanes on Long Stretch

On June 15, 1954, a contract in the amount of $1,685,727.85 was awarded to Fredrickson and Watson Construction Co. of Oakland, California, for the construction of 5.97 miles of State Highway Route VII-Ven-2-C between Central Avenue and the Santa Clara River. This project closed the gap between the previously constructed four-lane divided highway extending from east of Camarillo to City of Ventura, and, except for the short section over the mountainous Conejo Grade, there is now a four-lane divided highway from the city limits of Los Angeles at Calabasas all the way to the City of Ventura.

This part of US 101 traverses an alluvial plain which is subject to flooding during periods of heavy rainfall. Therefore, it was designed as a four-inch plant-mixed surface over eight inches of untreated rock base on imported borrow averaging three feet in thickness. The construction of the roadway embankment required approximately half a million cubic yards of imported borrow, most of which was placed within five months after the start of the contract. The major portion of imported borrow was taken from the bed of the Santa Clara River and hauled with two-wheeled tractors and scrapers, and 20-yard cable lift semitrailer dump trucks. This material was a granular mixture of sand and rock which provided an excellent "R" (resistance) value, and was sufficiently porous to qualify as a self-draining subgrade considered particularly desirable in this area. The structural section required 116,000 tons of untreated rock base and 60,000 tons of plant-mixed surfacing.

New Westbound Roadway

The southeasterly mile and one-half of the project consisted of building a completely new westbound roadway parallel to the existing two-lane facility and improving and resurfacing the existing roadway to serve eastbound traffic. The remainder of the contract required all new construction on the south side to be parallel to the existing road, leaving the old traveled way for a frontage road. A small community, known locally as Nyeland Acres, is located near the intersection with Rice-Santa Clara Avenue and numerous other residential and commercial improvements such as the town of El Rio, the Ventura County Service Center, and the State Highway Maintenance Station occupying the frontage on the north side of the existing highway for most of its length all the way to the Santa Clara River. The requirements of access for all these developments are admirably met by the design provision of leaving the old highway for a frontage road. Furthermore, future subdivisions will be easily accessible when the ultimate development of the area is complete.

Interchange Facilities

The right of way was primarily through orchards and truck farms, and adjacent improvements were as little disturbed as possible. However, the interchange facilities at the intersection of US 101 and Saviers Road required clearing enough area for the construction of interchange ramps.

The windbreaks of large eucalyptus trees lining both sides of the old highway were thinned out and trimmed. The remaining trees are picturesque and form a screen between the main line and the frontage road, thus serving both a useful and ornamental purpose.

The Y intersection at the junction of US 101 and US 101—Alternate was designed and constructed to eliminate all intersections at grade. Full traffic circulation, as well as access to the commercial establishments around the perimeter of the area, is provided for by circumferential frontage roads.

Five Bridges

Included in the contract were five bridges which were built under the direction of Louis E. Dunn, Bridge Department representative. Two of the structures were grade separations between state highways; one at the intersection with Saviers Road, and the other at the intersection of Coast Highway 101—Alternate. Both of these structures, as well as the frontage road overcrossing, which takes the previously mentioned peripheral frontage road over the Coast Highway, were built with structural steel girder decks. The girders varied in length, the longest measuring 123 feet

UPPER—View west in vicinity of Rose Road showing old highway right for use as north frontage road, taken just before completion of chain link fence and shoulder seal coat. LOWER—View toward east during latter stages of construction. Typical preservation of eucalyptus windbreak between new expressway and frontage road. Eastbound lanes at this point had not yet been put in operation.

The mountains back of the City of Ventura are framed by the separation structure at the intersection with Saviers Road. Picture taken from southbound off-ramp prior to placement of untreated rock base and plant-mixed surfacing on southbound lanes. Pneumatic-tired compactor seen in center proved most effective in consolidating granular fills.

and weighing approximately 17½ tons. The other two structures were built with reinforced concrete slab decks. Foundation problems required that four of the five structures be supported on piles.

Also as a part of the contract, 23 20,000-lumen electroliers and two sign bridges were installed. The larger sign bridge has a 60-foot span, and the frame, mounted with a minimum overhead clearance of 17 feet, is approximately eight feet high.

Traffic Through Construction

Handling public traffic through the construction zone was difficult only during such peak hours as occurred on holiday weekends, but with the helpful cooperation of the California Highway Patrol, delays were usually of short duration. Accidents were infrequent, and for the most part were not attributed to construction operations.

Weather conditions were ideal throughout the period of the contract. This was doubly fortunate since one leg of the detour at the west end of the job carried the westbound traffic across the bed of the Santa Clara River and it was possible to reroute traffic back over the bridge shortly before the riverbottom detour washed out.

Bernard V. Fredrickson, who was the contractor's superintendent on the project, took full advantage of the favorable weather to finish the job a month and a half before the expiration of the allotted official time limit of 275 working days.

The field supervisor for the District VII Construction Department was E. V. Parker, working under Assistant District Engineer Frank B. Cressy and District Engineer W. L. Fahey.

It is planned at some future date to build grade separation bridges at Rose Road and Santa Clara Avenue and to widen the Santa Clara River bridge. When these items of future construction are accomplished, a considerable length of this section of Ventura Boulevard will have the status of a full freeway. In the meanwhile, California motorists are collecting large dividends on their gasoline taxes by reason of the newly completed construction.

FROM MINNESOTA

MINNESOTA MINING & MANUFACTURING COMPANY
Saint Paul 6, Minnesota

California Highways and Public Works

GENTLEMEN: Your publication has recently come across my desk and I find that it is one of the most informative and well written periodicals on highway activities that I have seen for quite some time.

In the course of our activities with highway officials and consulting engineers throughout the Country, we find that a great deal of interest is shown in what you are doing with your complex traffic problems in California.

Cordially,

R. D. LOEFFLER

State Highway Contracts Awarded

MARCH-APRIL, 1955

Alameda County—US 50—At the intersection of US 50 and Harder Road. Widen and channelize the existing highway and connecting streets and install a traffic signal system and highway lighting. Contract awarded to Independent Construction Co., Oakland, $63,988.30.

Alameda County—At the intersection of Hoffman Boulevard with Buchanan Street. Construct additional roadway width for right-turn lane, place untreated base, place plant-mixed surfacing on untreated base and on traffic islands and install a two-phase traffic-actuated signal system and flashing beacon system. Contract awarded to Ets-Hokin and Galvan, Oakland, $11,024.

Alameda and Contra Costa Counties—SR 21—Between US 50 at Dublin and 0.2 mile north of Contra Costa county line. Construct a graded roadbed, partially on new alignment, together with ramps, road connections and approaches and place plant-mixed surfacing on imported subbase material and cement treated base and construct a reinforced concrete bridge, 2.2 miles. Contract awarded to Fredrickson & Watson Const. Co., Oakland, $531,-606.10.

Alameda County—SR 227—Between Thornhill Drive and Ascot Drive, 1.3 miles. Construct a graded roadbed and place plant-mixed surfacing on cement treated base and untreated base and construct two reinforced concrete bridges and one steel bridge, completion of which will provide four-lane divided highway with bridges at Park Boulevard Overcrossing, La Salle Avenue Overcrossing and at Bruns Drive Pedestrian Overcrossing. Contract awarded to Chas. L. Harney, Inc., San Francisco, $1,158,882.20.

Butte County—Alt. US 40—About 1.6 miles east of Pulga Bridge. Construct a graded roadbed, place imported base material and road-mix the upper two inches with liquid asphalt, 0.2 mile. Contract awarded to H. Earl Parker, Inc., Marysville, $44,655.

Colusa County—SR 20—Near the south city limits of Colusa. Extend the existing reinforced concrete box culvert on the left, widen the approaches and place untreated base, cement treated base and plant-mixed surfacing, 0.16 mile. Contract awarded to Baun Construction Co., Inc., Fresno, $14,367.

Contra Costa County—SR 24—Between 0.8 mile west and 0.5 mile east of Pleasant Hill Road, 1.3 miles. Construct a graded roadbed, pave with portland cement concrete on cement treated subgrade, surface, and construct a reinforced concrete bridge, to provide a four- and six-lane divided highway together with the Pleasant Hill Road Undercrossing. Contract awarded to Stolte Inc. & Gallagher & Burke, Inc., Oakland, $1,173,108.30.

Contra Costa County—SR 24—At the intersection of Sign Route 24 and Grant Street-Solano Way, in the City of Concord. Install a two-phase, full traffic-actuated signal system, rewire the existing highway lighting system in underground conduit, and remove and salvage portions of the existing span-wire mounted flashing beacon system. Contract awarded to Hall Sloat Electric Co., Inc., Oakland, $8,566.

Del Norte County—US 101—Between 0.4 mile south of Crescent City and the Oregon state line (portions). Place plant-mixed surfacing over existing surfacing at one location, construct cement treated base and untreated base and surfacing with plant-mixed surfacing at another, and construct cement treated base, cement treating the existing surfacing and base and surface with plant-mixed surfacing at another, 12.1 miles. Contract awarded to Mercer, Fraser Co. & Mercer, Fraser Gas Co., Inc., Eureka, $569,273.50.

Del Norte County—US 101—Across Smith River Overflow, about nine miles north of Crescent City. Construct a reinforced concrete bridge. Contract awarded to F. Fredenburg, Temple City, $71,781.50.

Del Norte County—SR 46—Between Klamath and 0.5 mile easterly. Construct a graded roadbed, place imported subbase material and imported base material and surface with road-mixed surfacing and replace the existing bridge with a reinforced concrete bridge, 0.5 mile. Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $136,354.50.

Fresno County—SR 41—On Abby Street and Blackstone Avenue, between Divisadero Street and Hedges Avenue. Construct a graded roadbed, place plant-mixed surfacing on cement treated base and on existing pavement and apply seal coat; construct a reinforced concrete bridge, and highway lighting and traffic signals, 1.5 miles. Contract awarded to Gene Richards, Inc., Fresno, $262,713.20.

Fresno County—SR 41 and US 99—At the intersection of Route 41 with Maple Avenue and US 99 with Highland Avenue. Construct channelization and install traffic signal system and highway lighting. Contract awarded to Volpa Brothers, Fresno, $14,819.

Humboldt County—US 101—Between 16th Street and west city limits. Surface with plant-mixed surfacing on the existing traveled way, shape the existing shoulders with additional untreated base and apply penetration treatment, 1.0 mile. Contract awarded to Mercer, Fraser Co., Inc., & Mercer, Fraser Gas Co., Inc., Eureka, $27,844.75.

Humboldt County—At the State Highway District Office in Eureka, develop and plant the grounds. Contract awarded to Bernard Gayman, South San Francisco, $9,106.88.

Humboldt County—US 101—Between north city limits of Eureka and 0.5 mile north of Gannon Slough, 5.3 miles. Place cement treated base and plant-mixed surfacing on an existing divided highway. Contract awarded to Mercer, Fraser Co. & Mercer, Fraser Gas Co., Inc., Eureka, $613,771.

Humboldt County—US 101—Between 0.4 mile and 0.9 mile south of Orick (portions). Construct a chain-link fence. Contract awarded to San Jose Steel Co., Inc., San Jose, $2,274.27.

Humboldt County—US 101—Between 0.8 mile and 2.5 miles north of Arcata. Construct two parallel reinforced concrete bridges at Arcata Overhead and a concrete bridge at Route 20/1 separation, remove an existing timber bridge and portions of an existing reinforced concrete and timber bridge and fill area provided by removal, all to provide for a future four-lane divided highway, 0.7 mile. Contract awarded to Mercer, Fraser Co. & Mercer, Fraser Gas Co., Inc., Eureka, $370,982.50.

Humboldt County—SR 96—Across Slate Creek, 8.2 miles east of Weitchpec. Redeck a bridge. Contract awarded to John W. J. Petersen, Beatrice, $11,-585.

Humboldt County—FAS 1201—Between south city limits of Eureka and 0.8 mile southerly. To be graded and surfaced with plant-mixed surfacing on imported base material and seal coats to be applied. Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $64,726.65.

Humboldt and Del Norte Counties—US 101—At the Garberville, Orick and Crescent City maintenance stations. Construct chain-link fences with gates. Contract awarded to United States Steel Corp., Amer. Steel & Wire Division, Cyclone Fence Dept., Oakland, $7,083.54.

Humboldt County—US 101—Across Eel River, south of Scotia. Clean and paint the existing bridge. Contract awarded to George C. Punton, San Diego, $29,970.

Humboldt County—US 101—At the intersection of US 101 and Humboldt Hill Road. Widen the existing roadway and surface channelization area with plant-mixed surfacing, 0.25 mile. Contract awarded to Mercer-Fraser Co. & Mercer-Fraser Gas Co., Inc., Eureka, $10,345.

Humboldt County—SD 36—About three miles east of Carlotta, at Cummings Creek. Construct a graded roadbed and surface with plant-mixed surfacing on imported base material, on new alignment, and construct a box culvert, 0.4 mile. Contract awarded to Paul E. Woof, Fresno, $44,-370.

Imperial County—US 80—Between the Dahlia Canal and Route US 99. Grade, place imported subbase material, place plant-mixed surfacing on cement treated base and on existing pavement, apply seal coats completion of which will provide a new four-lane divided highway, 0.5 mile. Contract awarded to N. L. Basich, Garvey, $80,583.

Imperial County—US 80—At El Centro Maintenance Station. Construct an office building. Contract awarded to Frank M. Pardue, El Centro, $15,984.50.

Kern County—US 6—Between Los Angeles county line and eight miles south of Mojave. Surface with plant-mixed surfacing on the existing traveled way, 8.3 miles. Contract awarded to Ralph B. Slaughter, Julian, $72,132.50.

Kern County—US 6—Between two miles north of Ricardo and Little Dixie Wash. Construct a graded roadbed and surface with plant-mixed surface on untreated base and place plant-mixed surfacing on existing pavement, 6.3 miles. Contract awarded to Basich Bros. Const. Co., R. L. Basich & N. L. Basich, South San Gabriel, $198,184.05.

Kern County—SR 178—At Bodfish Maintenance Station. Clear and grub the two-acre site, grade two-thirds of the site on two levels and grade two road approaches. Contract awarded to Irv. Guinn, Contractor, Bakersfield, $2,850.

Kern County—SR 139—Near the City of Wasco at Sixth Street. Grade and surface with road-mixed surfacing, 0.3 mile. Contract awarded to Geo. E. France, Inc., Bakersfield, $5,314.50.

Kern County—US 99—At Fort Tejon. Replace the existing wooden bunker with two metal tanks. Contract awarded to Chas. I. Cunningham Co., Oakdale, $7,682.

Lake County—SR 20—Between Laurel Dell Lake and Tule Lake (portions). Grade and surface with plant-mixed surfacing on cement treated base and construct connections and approaches, 2.4 miles. Contract awarded to Granite Construction Co., Watsonville, $418,268.

Lassen County—FAS 988—Between Stone Ranch and Slate Creek. Shape the existing roadbed and place plant-mixed surfacing on untreated base and apply a fog seal coat, 15.3 miles. Contract awarded to Claude C. Wood Co., Lodi, $214,711.

Los Angeles County—Between Pacific Electric Railway and Center Street, on Valley Boulevard. Widen the existing highway, place plant-mixed surfacing on untreated base and modify the traffic signal system and highway lighting. Contract awarded to Huskey Paving Co., El Monte, $13,-130.75.

Los Angeles County—Between 70th Street and Santa Barbara Avenue, on Harbor Freeway, 2.4 miles. Grade, pave with portland cement concrete on cement treated subgrade, place plant-mixed surfacing on cement treated base, untreated base, imported base and existing pavement and construct 11 bridges, four pedestrian undercrossings, portion of pedestrian undercrossing, one pump house and 13 retaining walls, completion of which provides an eight-lane divided freeway together with frontage roads, ramps, interchange lanes and connecting streets at Gage Avenue Undercrossing, 61st Street Pedestrian Undercrossing, 59th Place Undercrossing, Slauson Avenue Overhead, Slauson Avenue West Pedestrian Undercrossing, Slauson Avenue East Pedestrian Undercrossing, 54th Street Overcrossing, 52d Place Overcrossing, 51st Street Overcrossing, 49th Street Overcrossing, 47th Street Overcrossing, Vernon Avenue Overcrossing, 43d Street Overcrossing, 42d Street Overcrossing, 41st Street Pedestrian Undercrossing, 54th Street Overcrossing Pumping Plant, and portion of 40th Place Pedestrian Undercrossing. Contract awarded to J. E. Haddock, Ltd., Pasadena, $4,484,517.10.

Los Angeles County—SR 15—Between 0.1 mile south of Atlantic Boulevard and Leonis Street. Construct a graded roadbed and place pavement and surfacing and construct five bridges completion of which will provide undercrossings at Atlantic Boulevard Undercrossing, Atlantic Boulevard Undercrossing (on-ramp southbound), Bandini Boulevard Undercrossing, Bandini Boulevard Undercrossing (off ramp), and Atlantic Boulevard Undercrossing (on-ramp northbound), 0.5 mile. Contract awarded to Webb & White, Los Angeles, $1,244,951.

Los Angeles County—Between Tujunga Canyon Boulevard and Cypress Drive, on Foothill Boulevard. Construct a graded roadbed and place plant mixed surfacing on cement treated base and existing pavement, 4.5 miles. Contract awarded to Schroeder & Co., Sun Valley, $611,517.

Los Angeles County—Between Montana Street and Lincoln Avenue, on Canada Avenue. Grade and place plant mixed surfacing on cement treated base, 0.6 mile. Contract awarded to Osborn Company, Pasadena, $46,374.

Los Angeles County—At the intersection of Garey Avenue with Orange Grove Avenue. Furnish and install complete in place a full traffic actuated signal system with intersection lighting at the intersection of Garey Avenue with Orange Grove Avenue. Contract awarded to Westates Electrical Construction Co., Los Angeles, $10,542.

Los Angeles County—US 6—Between 0.8 mile north of Palmdale and Avenue J in Lancaster. Clear, grub and grade the existing shoulders, place road mixed surfacing and apply seal coat, 6.3 miles. Contract awarded to Henry Sturgeon & Son, Bakersfield, $18,291.50.

Los Angeles County—At the intersection of Sierra Highway with Palmdale Boulevard, in Palmdale. Install complete in place a two-phase full traffic actuated signal system and intersection lighting. Contract awarded to A-C Electric Co., Bakersfield, $11,365.

Los Angeles County—SR 7—Between Waterford Street and Casiano Road, 1.2 miles. Construct graded roadbeds, pave with portland cement concrete on cement treated subgrade, grade and surface frontage roads and on and off ramps with plant mixed surfacing on cement treated base and construct a reinforced concrete bridge, to provide a new six lane divided highway with frontage roads, on and off ramps and a bridge at Montana Avenue Undercrossing. Contract awarded to J. A. Thompson, J. A. Thompson & Son, J. A. Thompson & Son, Inc., Los Angeles, $1,328,738.

Los Angeles County—Across the Los Angeles River, on Olympic Boulevard, in the City of Los Angeles. Remove the existing concrete railings, railing bases, and balustrades and construct new railing bases, and new steel railings on the bridge. Contract awarded to H. N. Hanson Const. Co., Compton, $57,747.

Los Angeles County—At the intersection of Carson Street and Pioneer Boulevard near Long Beach. Install complete in place, a two-phase, semi traffic-actuated signal system and intersection lighting. Contract awarded to Ed Seymour, Long Beach, $11,875.

Mendocino County—At various locations. Install 10 culverts, a spillway assembly and downdrain. Contract awarded to Melvyn W. Oldham & Harold P. Hastings, Lakeport, $6,565.

Mendocino County—SR 128—Across Glynn Creek, about 18 miles west of Boonville. Remove the existing bridge and replace with a reinforced concrete bridge. Contract awarded to G. M. Carr Co. & Bati Rocca, Santa Rosa, $54,881.50.

Mendocino County—SR 1—At Little River, about eight miles north of the junction of Sign Routes 128 and 1 in Van Damme State Park. Construct a graded roadbed and place plant mixed surfacing on imported base material and construct a reinforced concrete bridge at Little River. Contract awarded to Thomas Construction Co., Fresno, $41,725.

Merced County—SR 123—Between SR 152 and Merced city limits, 0.7 mile. Grade the roadway and surface with plant mixed surfacing on untreated base and widen the bridges at Deadmans Creek, Mariposa Creek and Owens Creek, remove the existing bridge and replace with a reinforced concrete bridge at Miles Creek, remove the existing bridges and replace with reinforced concrete culverts at Chowchilla Creek, Snake Creek, North Fork Owens Creek, Owens Creek Overflow, Russell Ditch, Middle Slough and at Miles Creek Overflow. Contract awarded to Concrete Supply Co., Merced, $164,853.94.

Merced County—US 99—Between 2 and 11 miles south of Gustine. Reconstruct railings on four existing bridges at Garzas Creek Bypass, Quinto Bypass, Parnell Bypass and at San Luis Creek. Contract awarded to J. Kaus, Stockton, $9,990.

Monterey County—Between Del Monte Avenue and Fremont Street on Sloat Avenue and on Aguajito Road between Fremont Street and Farragut Road. Grade and place plant mixed surfacing on untreated base, 0.1 mile. Contract awarded to Granite Construction Co., Watsonville, $90,780.10.

Monterey County—SR 117—About nine miles southwest of Salinas. Fill an eroded gully with imported borrow, construct a plant mixed surfacing lined drainage ditch. Contract awarded to H. Sykes, Patterson, $4,555.

Monterey County—US 101—Between Canal Street in King City and 1.8 miles north of the Salinas River, 2.7 miles. Construct a graded roadbed and place cement treated base and plant-mixed surfacing, construct a steel bridge and revise the existing steel bridge, to provide a four-lane divided highway together with two bridges across the Salinas River. Contract awarded to C. K. Moseman, Redwood City, $1,103,629.

Monterey County—SR 1—At the intersection of Sign Route 1 with San Juan Road. Revise the existing signal system. Contract awarded to R. Flatland, San Francisco, $1,940.

Napa County—SR 37—Between four miles and 6.5 miles east of Napa city limits. Grade and surface with plant mixed surfacing, 1.2 miles. Contract awarded to Harold Smith, St. Helena, $67,307.20.

Orange County—SR 19—One mile north of Brea. Construct a loadometer pit installation and surface the approaches and parking area with plant mixed surfacing on untreated base. Contract awarded to Cox Brothers Constr. Co., Stanton, $4,167.40.

Orange County—US 101—Between Sixth Street in Tustin and Mabury Street. Subseal the existing pavement and surface with plant mixed surfacing, 1.5 miles. Contract awarded to Cox Bros. Construction Co., Stanton, $36,791.50.

Plumas County—SR 89—Between Graeagle and US 40 Alternate. Construct a two lane graded road bed and place road-mixed surfacing on cement treated base and construct a steel bridge with reinforced concrete deck, 1.0 mile. Contract awarded to M. W. Brown & R. E. Hertel, Redding, $197,039.10.

Plumas County—SR 89—Between Westwood Road and Almanor Dam. Construct a two-lane graded roadbed, place imported subbase material, construct cement treated base and surface with road mixed surfacing, completion of which provides a roadway on a new alignment eliminating a portion of sharp curved winding roadway, 0.5 mile. Contract awarded to W. H. Darraugh & Sons, Yuba City, $42,191.

Plumas County—FAS 1060—Between Quincy and 2.5 miles north. Construct a two lane roadway by grading, placing untreated base and apply prime coat and construct a reinforced concrete bridge across Greenhorn Creek, 2.5 miles. Contract awarded to R. E. Hertel, Sacramento, $83,579.

Riverside County—US 60-70—At Desert Center Maintenance Station. Construct a pump shelter with concrete footings and floor, install a deep water pump, gas engine, electric motor with pump, tanks, flourine removal equipment and distribution equipment. Contract awarded to Meredith & Simpson, Thermal, $11,236.

Riverside County—US 60, 70, 99—Between 22d Street in Banning and 0.7 mile east of Banning. Construct graded roadbeds and place portland concrete pavement, construct road and street approach connections and frontage roads and place plant mixed surfacing, construct a reinforced concrete bridge, perform slope erosion control work, install highway lighting and illuminated sign systems, completion of which will provide new four lane divided highway together with frontage roads and connections, and a concrete overcrossing at San Gorgonio Avenue, 3.5 miles. Contract awarded to J. A. Thompson, J. A. Thompson & Son, J. A. Thompson & Son, Inc., Inglewood, $1,103,171.

Sacramento County—US 50—Between 0.4 mile east of Mills and one mile west of Nimbus. Place plant-mixed surfacing over existing pavement and apply a penetration treatment to the shoulders, 4.4 miles. Contract awarded to McGillivray Construction Co., Sacramento, $46,447.79.

Sacramento County—US 99—Between 1.8 miles south of Florin Road and Jansen Drive. Widen the existing roadbed, surface with plant-mixed surfacing on cement treated base and widen seven bridges at Beacon Creek, Dome Creek, South Branch Florin Creek, Florin Creek, Elder Creek, Morrison Creek, Popper Draw, completion of which will provide four-lane roadway, 3.9 miles. Contract awarded to McGillivray Construction Co., Sacramento, $361,730.05.

San Benito County—SR 25—Across the San Benito River, about 8.5 miles north of the junction of Sign Route 25 and State Route 120. Construct a welded steel girder bridge and grade the bridge approaches and surface with road-mixed surfacing, 0.4 mile. Contract awarded to Bos Construction Co. & John A. Carstensen Berkeley, $113,968.70.

San Benito County—US 101—About 1.25 miles south of San Benito River Bridge. Remove a section of portland cement concrete pavement and grade and surface the outer shoulder and the area of concrete pavement removal with plant mixed surfacing on untreated base, 0.2 mile. Contract awarded to Granite Construction Co., Watsonville, $9,491.

San Bernardino County—US 466—Between the junction of Route 191 and 0.6 mile north of Devore. Widen the existing roadbed by building up existing shoulders with excavated material, place plant-mixed surfacing over the existing surfacing and a portion of the widened roadbed and apply seal coats, 2.1 miles. Contract awarded to George Herz & Co., San Bernardino, $64,541.70.

San Bernardino County—US 395—Between 2.8 miles south and 1.4 miles north of Adelanto. Construct a graded roadbed, place imported borrow, imported subbase, and imported base material, surface with road-mixed surfacing and apply seal coats, 4.5 miles. Contract awarded to Geo. Herz & Co., San Bernardino, $209,138.20.

San Bernardino County—US 66—Between one mile south of Palmdale Road and 0.5 mile north of First Street. Construct a graded roadbed and place plant mixed surfacing on cement treated base and existing pavement and construct a reinforced concrete bridge completion of which will provide a four-lane divided highway, 3.8 miles. Contract awarded to Norman I. Fadel, Inc., Bert C. Altfillisch & Altfillisch Const. Co., North Hollywood, $612,353.37.

San Bernardino County—At the intersection of Orange Street with Lugonia Avenue in Redlands, install a full traffic actuated signal system and highway lighting. Contract awarded to Paul R. Gardner, Ontario, $9,014.

San Diego County—US 101—On Harbor Drive, at Woden Street in National City and at 32d Street in San Diego. Construct channelization and two welded steel bridges at 32d Street Pedestrian Overcrossing and at Woden Street Pedestrian Overcrossing. Contract awarded to M. H. Golden Construction Co., San Diego, $142,861.40.

San Diego County—US 101—Between Fifth Street and Harbor Street in San Diego. Construct a four foot curbed and surfaced median island, 0.2 mile. Contract awarded to Sim J. Harris Co., San Diego, $4,076.39.

San Diego County—SR 79—Between 0.3 mile south of Inspiration Point and Julian, 3.0 miles. Construct a graded roadbed and surface with road-mixed surfacing on cement treated base. Contract awarded to Ray Reed Co. & Conrad Constr. Co., Inc., Santa Paula, $232,087.12.

San Francisco—Between 15th, 16th, San Bruno and Vermont Streets, at the San Francisco Maintenance Station. Install three metal buildings, water, sewer and electrical facilities, and grade and compact building sites and yard area. Contract awarded to Chas. L. Harney, Inc., San Francisco, $52,761.50.

San Francisco—Between Howard Street and Merchant Street, on the Embarcadero. Drive three steel H piles at separate locations, all in connection with future construction. Contract awarded to Cantor & Coull, Alameda, $11,410.

San Francisco County—Between Key Avenue and 0.2 mile north of Silver Avenue, on Bayshore Boulevard. Surface the existing pavement with plant-mixed surfacing, 1.1 miles. Contract awarded to The Fay Improvement Co., San Francisco, $18,449.

San Francisco County—Embarcadero Freeway—Between San Francisco-Oakland Bridge, at Fourth Street and Main Street. Completion of this contract will provide a multi-lane multi-level separation composed of standard weight reinforced concrete box girder spans, light weight reinforced concrete box girder spans and welded steel girder spans supported by bents of like material, part of which are founded on spread footings and part on steel pile and concrete pile foundations, and roadways consisting of constructed contour graded areas, graded roadbeds for ramp approaches, city streets, railroads and railroad service areas, and surfaced with plant-mixed surfacing on cement treated base. Contract awarded to MacDonald Young & Nelson Inc. & Morrison-Knudsen Co., Inc., San Francisco, $5,213,162.

San Francisco County—Bayshore Freeway—Between 0.1 mile north and 0.7 mile south of San Francisco-San Mateo county line. Construct a graded roadbed, 0.8 mile. Contract awarded to John Delphia, Patterson, $358,595.

San Joaquin County — SR 12 — Between 1.2 miles east of Clements and Calaveras County line. Construct a graded roadbed and place plant-mixed surfacing on untreated base over an imported subbase material, 4.3 miles. Contract awarded to Claude C. Wood Co., Lodi, $214,792.25.

San Luis Obispo County — Across Atascadero Creek, in the Town of Atascadero. Construct a pedestrian walk on the Atascadero Creek Bridge. Contract awarded to Walter J. Schmid, Morro Bay, $3,730.

San Luis Obispo County—FAS 684—Between a graded roadbed and approaches on new alignment, 1.3 miles. Contract awarded to Valley Paving & Const. Co., Inc., Pismo Beach, $72,570.

San Luis Obispo County—SR 1—At Morro Creek about 12 miles north of the City of San Luis Obispo. Widen the existing reinforced concrete bridge and widen the approach roadways by grading and placing plant-mixed surfacing on untreated base. Contract awarded to Lew Jones Const. Co., San Jose, $41,091.50.

San Luis Obispo County—In Pismo Beach State Park. Grade an existing access road and service area, place untreated base, apply prime coat, surface with plant-mixed surfacing and apply seal coats. Contract awarded to Bickmore-Harper Inc., Santa Maria, $4,893.

San Mateo—US 101—At the intersection of Fifth Avenue and El Camino Real. Construct median lanes and install a traffic signal system with highway lighting. Contract awarded to Hall Sloat Electric Co., Inc., Oakland, $18,063.

San Mateo County—Bypass US 101—Between 0.3 mile north of Willow Road and 0.5 mile south of Willow Road. Construct graded roadbeds and pave with portland cement concrete on cement treated subgrade and with plant-mixed surfacing on cement treated base and construct a steel bridge (Willow Road Separation), 0.8 mile. Contract awarded to L. C. Smith Co., San Mateo, $779,137.15.

San Mateo County—SR 1—Across Tunitas Creek about 22 miles north of Santa Cruz county line. Repair existing timber trestle bridge by replacing damaged and decayed portions. Contract awarded to Chas. I. Cunningham Co., Oakdale, $4,890.

San Mateo County—US 101 Bypass—Between 0.1 mile north of 16th Avenue and 0.2 mile south of Bransten Road. Resurface the existing southbound traveled way and shoulders with plant-mixed surfacing, and apply a medium seal coat to the shoulders, 5.0 miles. Contract awarded to L. C. Smith, San Mateo, $73,264.15.

Santa Barbara County—SR 166—Between 1.7 miles east of Clear Creek and 2.3 miles west of the second crossing of Cuyama River. Construct a graded roadbed and surface with road-mixed surfacing, 0.3 mile. Contract awarded to Hermreck & Easter, Santa Maria, $98,686.

Santa Barbara County—SR 150—Between Painted Cave Road, about six miles north of Santa Barbara city limit, and San Marcos Pass. Construct a graded roadbed, placing plant-mixed surfacing on cement treated base and apply a seal coat, to provide a two-lane highway together with road approaches, on new alignment eliminating many curves, 1.9 miles. Contract awarded to John F. Blademore, El Monte, $784,361.60.

Santa Barbara County—SR 150—Between Leadbetter Road and La Marina Drive. Construct a graded roadbed, place imported subbase material and untreated base, surface with plant-mixed surfacing and apply seal coat, 0.6 mile. Contract awarded to Valley Paving & Const. Co., Inc., Pismo Beach, $137,385.

Santa Clara County—US 101—Between Ford Road and Llagas Creek (portions). Widen the existing road and place bases and surfacing, remove railing at the south end of the bridge across Coyote Creek and construct connections and approaches, 12.7 miles. Contract awarded to Carl N. Swenson Co., Inc., San Jose, $488,111.30.

Santa Clara County—At the intersection of Moffet Boulevard with Bayshore Highway, near Mountain View. Modify the existing two-phase, full traffic actuated signal system to a three-phase full traffic-actuated system. Contract awarded to Abbett Electric Corp., San Francisco, $3,420.

Santa Clara County—Bypass US 101 and SR 115—At Santa Clara Street Overpass in San Jose. Modify the existing traffic island curb returns, relocate electroliers and install flashing beacons. Contract awarded to Progress Electric, Palo Alto, $3,558.54.

Santa Cruz County—SR 9—Between 1.6 miles and 1.7 miles north of Santa Cruz. Grade a roadbed and surface with plant-mixed surfacing on untreated base, 600 feet. Contract awarded to John A. Carstensen, Castro Valley, $13,484.

Santa Cruz County—FAS 1145—At Hester Creek about five miles north of Soquel, on Old San Jose Road. Construct a graded roadbed, place double seal coat, remove existing bridge and construct new culvert, 0.3 mile. Contract awarded to Los Gatos Construction Co., Los Gatos, $28,747.

Shasta County—US 299—At South Cow Creek, about 0.3 mile south of Millville. Construct a steel girder with reinforced concrete deck bridge; and approach roadways by grading and surfacing with plant-mixed surfacing on untreated base, 0.2 mile. Contract awarded to Thomas Construction Co., Fresno, $126,874.

Shasta County—US 299—At Stillwater Creek, about four miles east of Redding. Construct a reinforced concrete bridge and widen the approaches by grading and surfacing with plant-mixed surfacing. Contract awarded to Fredrickson & Watson Const. Co., Oakland, $57,777.77.

Shasta County—US 299—Between Deb's Place and Summit Hatchet Mountain. Construct a graded roadbed, place imported subbase material, place plant-mixed surfacing over cement treated base, and remove an old bridge, completion of which will provide a roadway on new alignment eliminating many curves, 4.9 miles. Contract awarded to Fredrickson & Watson Construction Co., Oakland, $555,355.55.

Shasta County—SR 89—At Doyel Cattlepass, about five miles south of junction of Route US 299 and SR 89. Replace the existing bridge with a reinforced concrete bridge. Contract awarded to Walter H. Lindeman, Red Bluff, $10,080.

Siskiyou County—SR 96—Across Indian Creek, in Happy Camp. Redeck a steel truss and timber trestle bridge. Contract awarded to Bob Construction Co., Berkeley, $26,783.

Solano and Napa Counties—US 40—Between 0.7 mile east of Route 208 and Cordelia Underpass. Place plant-mixed surfacing over portions of the existing pavement and grade and surface parking areas with plant-mixed surfacing on cement treated base, 5.5 miles. Contract awarded to Parish Brothers, Inc., Benicia, $118,205.50.

Sonoma County—US 101—Between three miles north of Cotati at Wilfred and existing US 101 at Denman, 7.9 miles. Construct portland cement concrete pavement on cement treated subgrade; place plant-mixed surfacing on cement treated base and on existing pavements and apply seal coats; construct three reinforced concrete bridges and widen one bridge, to provide a four-lane divided highway together with frontage roads, private roads and road connections. The bridges are located at Railroad Avenue Undercrossing, Roblar Avenue Undercrossing, Route 1/104 separation and at Copeland Creek. Contract awarded to Parish Bros., Inc. & Parish Bros. & Carl N. Swenson Co., Inc., Benicia, $2,138,968.65.

Sonoma County—US 101—Between 2.3 miles north of Santa Rosa and 4.1 miles south of Healdsburg, at four locations. Place reinforced concrete pipe culverts at four locations. Contract awarded to Al Erickson & Company, Napa, $3,716.

Sonoma County—SR 1—Between Fort Ross and Stewart's Point (portions). Construct graded roadbed, place imported subbase material, untreated base and road-mixed surfacing, 2.7 miles. Contract awarded to Huntington Brothers, Napa, $203,952.

Sonoma County—SR 104—Between east city limits of Petaluma and 4.7 miles east of Petaluma. Place plant-mixed surfacing over existing traveled way and construct shoulders of untreated base and apply a penetration treatment, 4.1 miles. Contract awarded to Reichhold & Jurkovich & Lee J. Immel, San Pablo, $69,602.05.

Stanislaus County—FAS 919—Between McDonald Creek and Merced county line. Construct a graded roadbed, place imported base material, untreated base and surface with road-mixed surfacing, 3.3 miles. Contract awarded to M. Malfitano & Son, Inc., Pittsburg, $92,702.80.

Tehama County — US 99E — Between Butte county line and Los Molinos. Construct a graded roadbed and place plant-mixed surfacing over cement treated base, existing surfacing and untreated base, 11.7 miles. Contract awarded to Clements & Co., Centerville, $678,174.12.

Tehama County—SR 36—Across South Fork Cottonwood Creek, about 15 miles west of Red Bluff. Repair the existing timber bridge. Contract awarded to Western Builders, Palo Alto, $4,341.50.

Tehama County—FAS 1080—Between Tehama and Proberta. Scarify and reshape the existing roadbed, place untreated base and surface with plant-mixed surfacing, 4.4 miles. Contract awarded to Baun Construction Co., Inc., Fresno, $70,595.

Tehama County—SR 36—0.5 mile north of junction of Route US 99E with SR 36, about 3.5 miles east of Red Bluff. Furnish and erect a prefabricated metal truck shelter, metal gas and oil house, metal pump house, office building, timber car port, complete. Contract awarded to J. H. McAnulty, Chico, $53,379.

Tulare County—SR 131—At Caesar Ditch on Conejo Avenue about 3.5 miles east of Kingsburg. Replace the existing concrete arch culvert with double corrugated metal pipe arches and concrete head walls. Contract awarded to Volpa Brothers, Fresno, $4,660.

Tulare County—SR 63—At the intersection of Sign Route 63 with Acequia and Center Streets. Install complete in place traffic signal systems at two locations and interconnecting the new systems to existing traffic signal systems. Contract awarded to A C Electric Co., Bakersfield, $7,321.

Yolo County—SR 16—Between Rumsey and 2.3 miles north. Construct a graded roadbed and place road-mixed surfacing on untreated base and imported subbase material and construct a reinforced concrete slab bridge across Rumsey Canyon Pine Creek, 2.1 miles. Contract awarded to R. A. Farish Co., Stockton, $175,350.80.

WORLD'S BUSIEST HIGHWAY

The intersection of the Pasadena-Harbor Freeway and the Hollywood Freeway, at the four-level interchange structure, handles some 242,000 vehicles every weekday. This is believed to be the busiest highway intersection in the world.

Famous Test Driver Praises Directional Signs in California

Ab Jenkins, executive assistant to the State Road Commissioner of Utah and nationally famous as an auto racing and test driver, had high praise for California's State Highway System and laboratory research work when he called on Director of Public Works Frank B. Durkee.

Jenkins holds all automobile speed records and has driven more than 2,000,000 miles without an accident of any kind. He has visited every state as a traffic safety engineer. He is a former mayor of Salt Lake City.

"I am out here in California checking on the different highway safety devices," Jenkins said. "The one in which I am very much interested is your striping equipment for highway striping. There is no state in the Union that is better marked with directional signs and stripings than the State of California.

"It is almost impossible to get lost in California, and it isn't necessary to waste a lot of time asking questions—your highways are so well marked that if one is driving from one city to another, even though you are going to a small community, you will find a sign "Turn Right," "Turn Left," within a radius of 1,000 feet—maybe the next one, 500 feet; then a large overhead sign that points in the direction in which you should go.

"That is what I mean by your markings."

TRAFFIC ENGINEERS PLAN FOR SILVER ANNIVERSARY

The Institute of Traffic Engineers held its first meeting on October 2, 1930, in the William Penn Hotel in Pittsburgh, Pennsylvania. There were 19 members present at the first organization meeting.

In 1955, the members of the institute are returning to the William Penn Hotel in Pittsburgh for the Silver Anniversary Meeting which is scheduled for October 23d to 27th inclusive. The membership has grown in 25 years from 19 to approximately 800.

New Law Will Speed Highway Construction

State Highway Engineer George T. McCoy commented on legislation signed by Governor Knight permitting award of state highway contracts on and after the first day of January preceding the July 1st beginning of the fiscal year in which the projects are budgeted. Previously, the law provided that the award of contracts could be made on and after the first day of April.

McCoy said the change in the law would assist the highway program in several ways. First, it will permit earlier start of construction whenever weather and local conditions are favorable—thus increasing the effective length of the construction season and permitting earlier completion of projects. This is particularly important for jobs which can be completed in one season. Many of the late fall finishing troubles can be avoided and many projects can be completed which would, under past practice, have required a winter shutdown, with completion the next season.

Another advantage will be that projects can be advertised and awarded over a longer part of the winter period when contractors have available time to examine projects and prepare bids. Earlier award dates will also permit stockpiling of materials during the winter on jobs which can be started in the spring.

A COMPLIMENT

4020 Bayview Avenue
San Mateo, California

California Highways and Public Works, Sacramento, California

Gentlemen: From time to time I have had occasion to see copies of your magazine, *California Highways and Public Works*. I have not only found these occasional contacts with the magazine a distinct pleasure but it always creates a sense of pride in my native State and a large degree of admiration for the Division of Highways.

Very truly yours,

Brian F. Menzies

In Memoriam

BORIS MICHAEL SHIMKIN

It is with great sorrow that the Bay Bridge office has to report the death of Boris Michael Shimkin, Associate Bridge Engineer, at the age of 66, after a long and varied career in engineering.

Mr. Shimkin, a member of the Russian nobility of Smolensk province, was born in Omsk, Siberia, the son of Michael Boris and Lydia C. (Kolabov) Shimkin. He received his technical education at the Tomsk Technological Institute of Nicholas II from which he was graduated in 1914 with the degree of Civil Engineer. After coming to the United States, he received the degree of master of science in civil engineering from the University of California in 1928. He was married on January 8, 1912, to Dr. Lydia J. Serebrov.

During World War I Mr. Shimkin served the Russian Government as a colonel of engineers in the Imperial Russian Army. He spent most of 1919 and 1920 in Vladivostack where he was chief engineer on port installations and other facilities. He escaped with his family just before the Bolsheviks seized the city, and made his way to Java. After two years in Java he came to the United States, in the summer of 1923, bringing his family with him. He became an American citizen in 1928.

After working for several employers in the San Francisco area, generally in the structural engineering field, he was appointed Associate Bridge Engineer in the Bridge Department of the Division of Highways in October, 1933. For the next 10 years, with the exception of about a year and a half at the Bay Bridge design office, Mr. Shimkin worked at Bridge Department Headquarters in Sacramento. In the latter part of 1943 he was transferred to the Bay Bridge engineering office where he served as Associate Bridge Engineer until the time of his death.

He is survived by his widow and two sons, Dr. Michael Shimkin and Dr. Demitri Shimkin, to whom deep sympathy is extended.

GOODWIN J. KNIGHT
Governor of California

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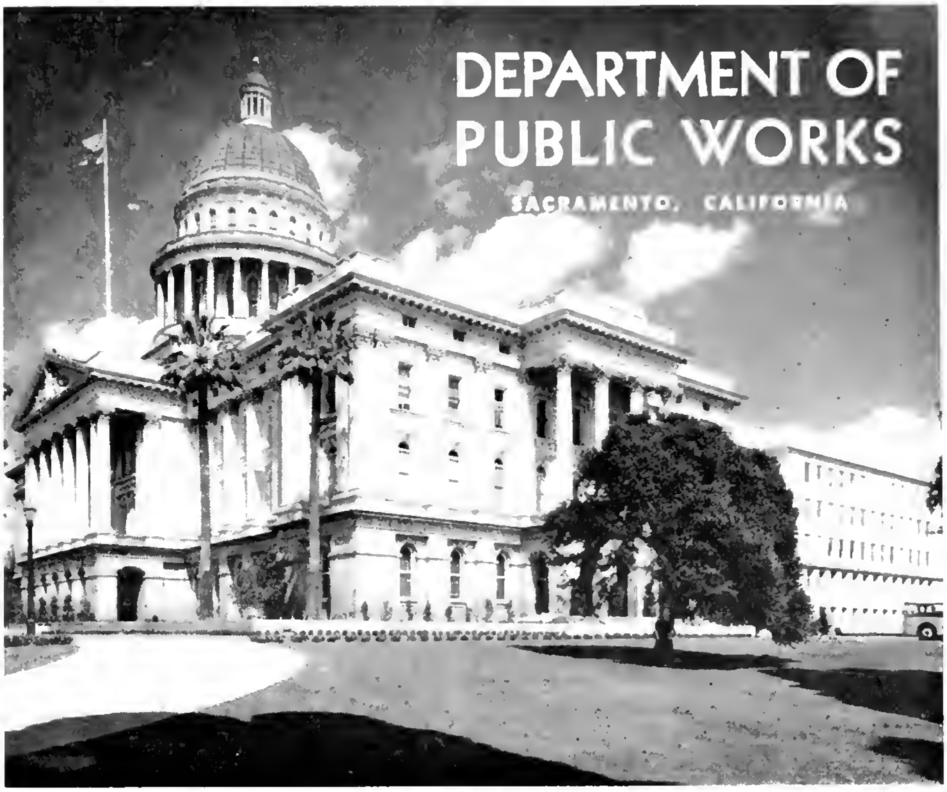

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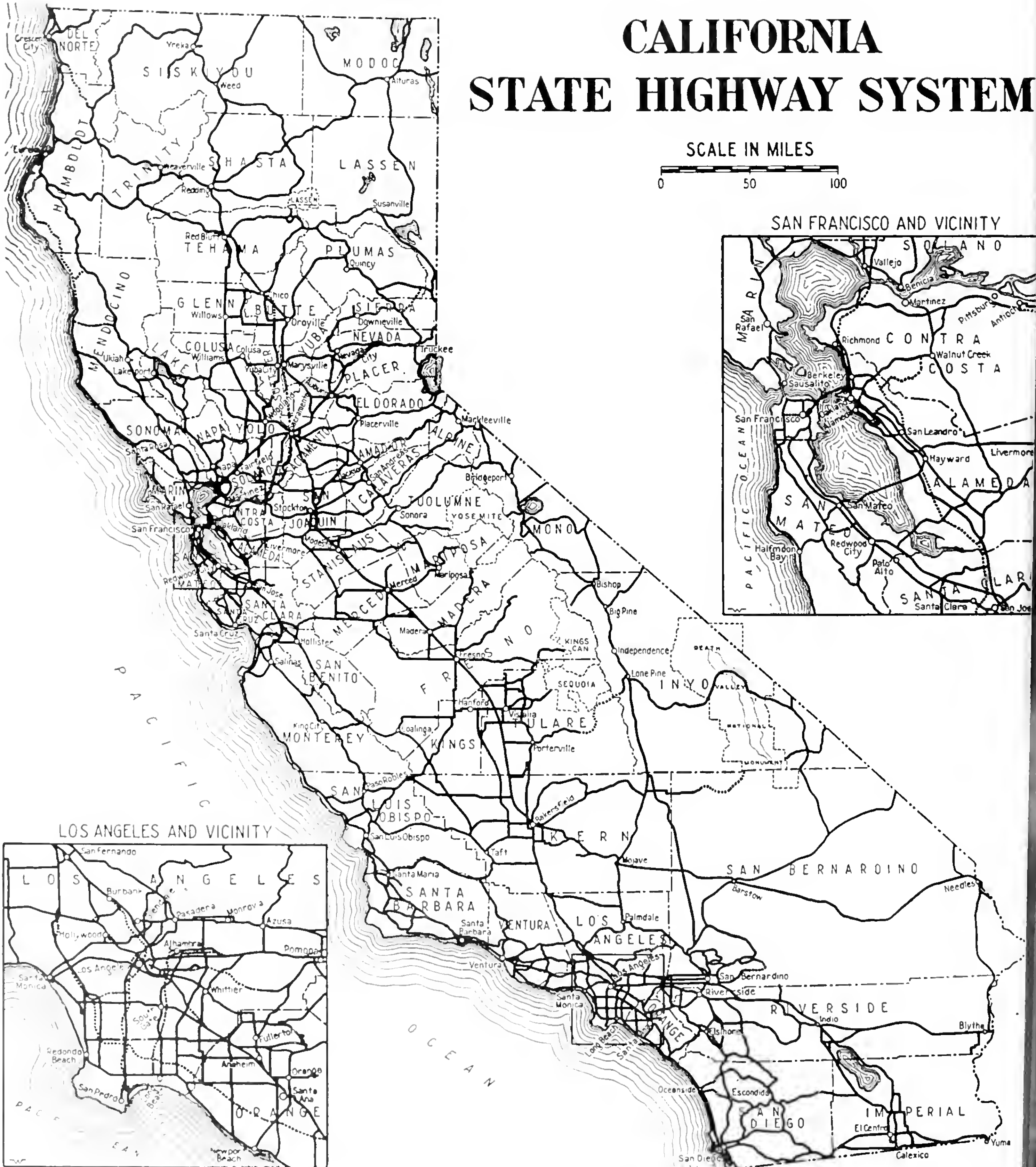
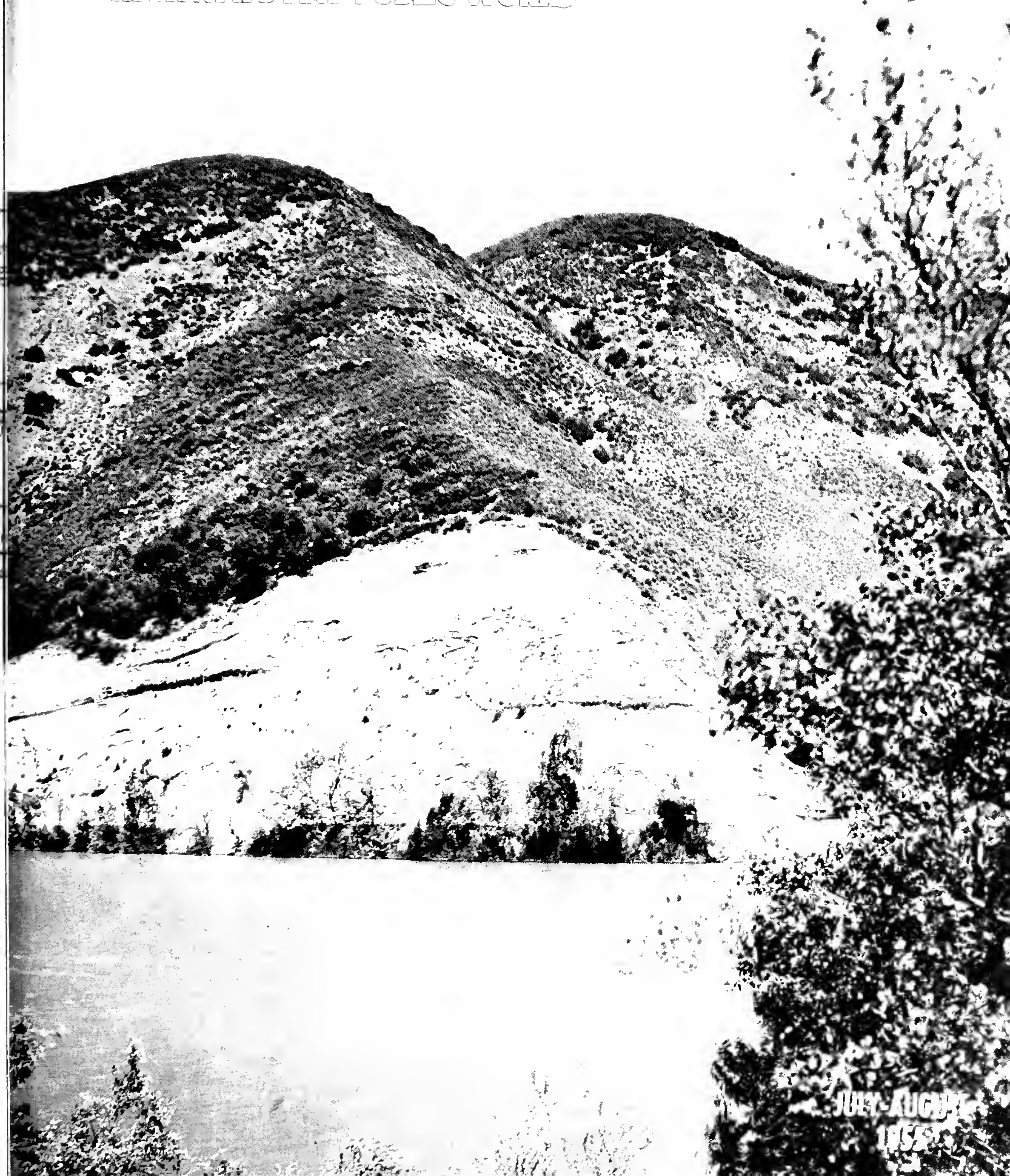


Oct. 1953

CALIFORNIA HIGHWAYS AND PUBLIC WORKS



JULY-AUGUST
1955

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Public Works Building Twelfth and N Streets Sacramento

CONTENTS

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Address communications to
CALIFORNIA HIGHWAYS AND PUBLIC WORKS
P. O. Box 1499
Sacramento, California

Parallel Bridge Across Carquinez

By C. H. DARBY,
Senior Bridge Engineer

Legislature and Governor Provide for New Strait Span

GOVERNOR GOODWIN J. KNIGHT on June 16th signed Senate Bill No. 1450 providing for construction of an additional Carquinez Strait Bridge and a bridge between Benicia and Martinez as toll facilities and promptly called a meeting of the California Toll Bridge Authority, of which he is chairman, to set in motion legalities for the issuance of revenue bonds, to finance the projects.

The estimated cost of the bridges is $73,000,000 including the cost of bond financing. The Senate bill, introduced by Senator Luther E. Gibson of Vallejo, includes more than eight miles of Carquinez Bridge approaches on US 40. Construction of the parallel Carquinez Bridge will start as soon as bond financing by the California Toll Bridge Authority can be arranged under the terms of the legislation.

Depending on the speed with which these financing arrangements can be completed, actual construction on the Carquinez project can begin this fall. Completion of the new bridge and sufficient approaches for the start of toll collections would be scheduled for some time in 1958.

Plans Advance Rapidly

Plans for the Benicia-Martinez structure are being advanced rapidly with the aim of opening that bridge to the public in 1959.

Construction plans are already well advanced on the new Carquinez Bridge and the south approach. The object is to open that portion of the facility to traffic as early as possible for two important reasons: relief from the congestion which is particularly serious on the present south approach as well as on the existing bridge itself; and assurance of an early start on repayment of the bonds from toll collections, which is expected to encourage more favorable interest rates on the bonds.

The expected order of work on the Carquinez project is as follows:

Award contract and begin construction of the bridge substructure.

Award contract for the superstructure, so that fabrication of steel can get under way in the mills while the substructure is being placed.

Start the grading for the south approach so that the very deep and wide cuts through the Valona Hills will have time to stabilize before paving is undertaken.

In the meantime, approach construction through Vallejo will be expedited, although operation of the new bridge is not dependent on that portion of the work in view of the existing multilane divided highway.

Existing Structure Inadequate

A look at the map reveals how the waterway formed by San Francisco Bay, Carquinez Strait, and the San Joaquin River effectively cuts California in two and blocks north-south motor vehicle travel for nearly half the width of the State. For 90 miles from Stockton to the Golden Gate, the waterway is bridged at only two places by highway spans. In 1927 the present bridge across Carquinez Strait provided a long-needed access across this barrier at one of these locations. The Carquinez Bridge was one of the engineering marvels of its day and its double spans still merit recognition as the fifth longest cantilever spans in the world.

Modern traffic and California's phenomenal growth have taken their toll of the old structure, however, and now its three-lane roadway is inadequate for the thousands of vehicles which daily crowd across it. Once

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BRIDGE RESOLUTION

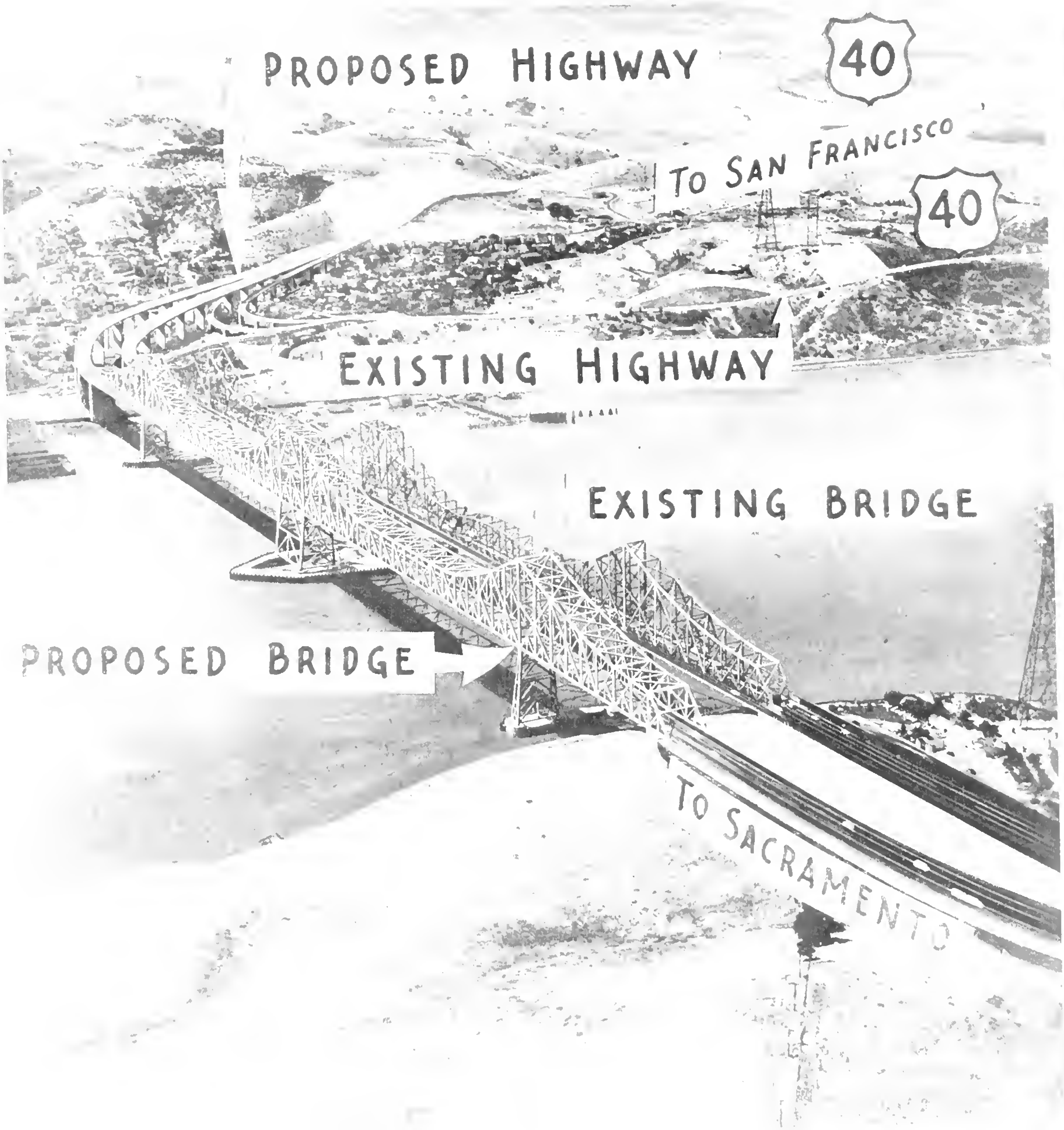
Now, therefore, be it resolved by the California Toll Bridge Authority, as follows:

1. The California Toll Bridge Authority hereby determines that, if financially feasible, it is for the best interests of the public highways of the State of California that the above-mentioned facilities be constructed, and the existing Carquinez Bridge be modified and improved, all under the provisions of the California Toll Bridge Authority Act.

2. The Director of Public Works is hereby authorized and directed to cause the Department of Public Works to complete all necessary engineering, traffic, revenue, financing, and legal studies, and to prepare and submit to the California Toll Bridge Authority the recommendations of the Director of Public Works, together with the preliminary estimates of the cost of construction of all of said facilities, and estimates of the amount required to be raised for that purpose by the issuance of revenue bonds. * * *

3. The Director of Public Works, in preparing his recommendations and in considering the form of any bond resolution, is requested, if found legally and practically feasible, to provide for the reimbursement of the State Highway Fund of any advancements made therefrom from and after the effective date of Chapter 960, Statutes of 1955, for the purchase of rights of way required for the ultimate completion of the facilities mentioned in said Chapter 960.

4. In the event the Director of Public Works determines that he will recommend to this authority that revenue bonds be issued for the construction of the facilities mentioned in Chapter 960, Statutes of 1955, the department is authorized to advertise for construction bids at such time and in such manner as to permit the execution of construction contracts simultaneously with the delivery of, and receipt of proceeds from, revenue bonds to be issued by this authority.



Carquinez Strait has become a bottleneck to north south travel.

The problem did not come suddenly.

Long ago it became obvious that something was going to have to be done to increase the capacity at Carquinez. The old bridge has only a 30-foot roadway really too narrow for the three lanes which now use it. This inadequacy is not the fault of the structure itself. The traffic has jumped from less than 1,000,000 vehicles per year, when the bridge was first opened, to over 10,000,000 at the present time.

As a logical first step, the old bridge was examined to see if revisions could be made to increase its capacity. One of the first ideas was to double-deck the old structure to provide three lanes in each direction. However, even as these studies were being made, the traffic reached a figure of 18,000 vehicles per day crossing the structure. It was obvious that three lanes in each direction would not be adequate as an ultimate solution.

Only Logical Solution

Next a temporary solution was sought by hanging additional lanes on brackets on the outside of the trusses. This would have provided a solution only for a short time and the bridge would have been overcrowded almost before the repairs could be completed. From all of these studies the present plan emerged as the only logical solution.

The new design for which plans have been prepared will provide for a new four-lane parallel bridge about 200 feet upstream from the present one. Traffic will travel north on the new bridge and south on the old. Remodeling of the present bridge, utilizing an outrigger lane on each side, would provide an ultimate four lanes on that structure.

There will be very little interference with traffic during construction. While the new bridge is being built, traffic will be maintained as usual on the old structure.

All Possible Crossings Studied

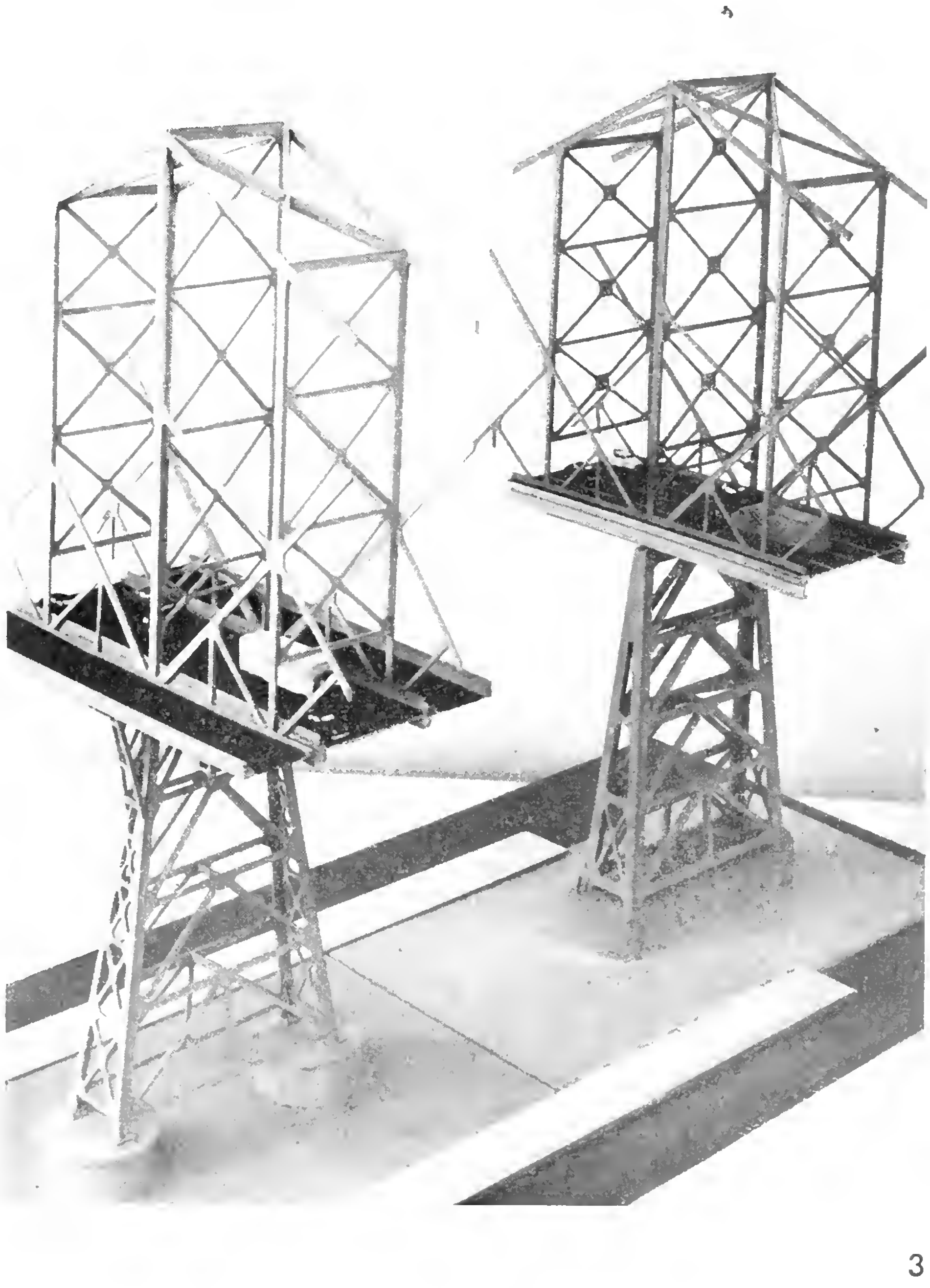
Before settling on a final design which provided for the construction of a parallel bridge, all of the possible crossings of Carquinez Strait from Selby Point to Dillon Point were considered. Along this three-mile stretch of the strait, the Carquinez Bridge location is the best for a number of different reasons. The cost of the approach highway construction through the rough country on each side of the strait east of Crockett ruled out a bridge in that location. Sites to the west also were studied but they likewise proved to be more expensive.

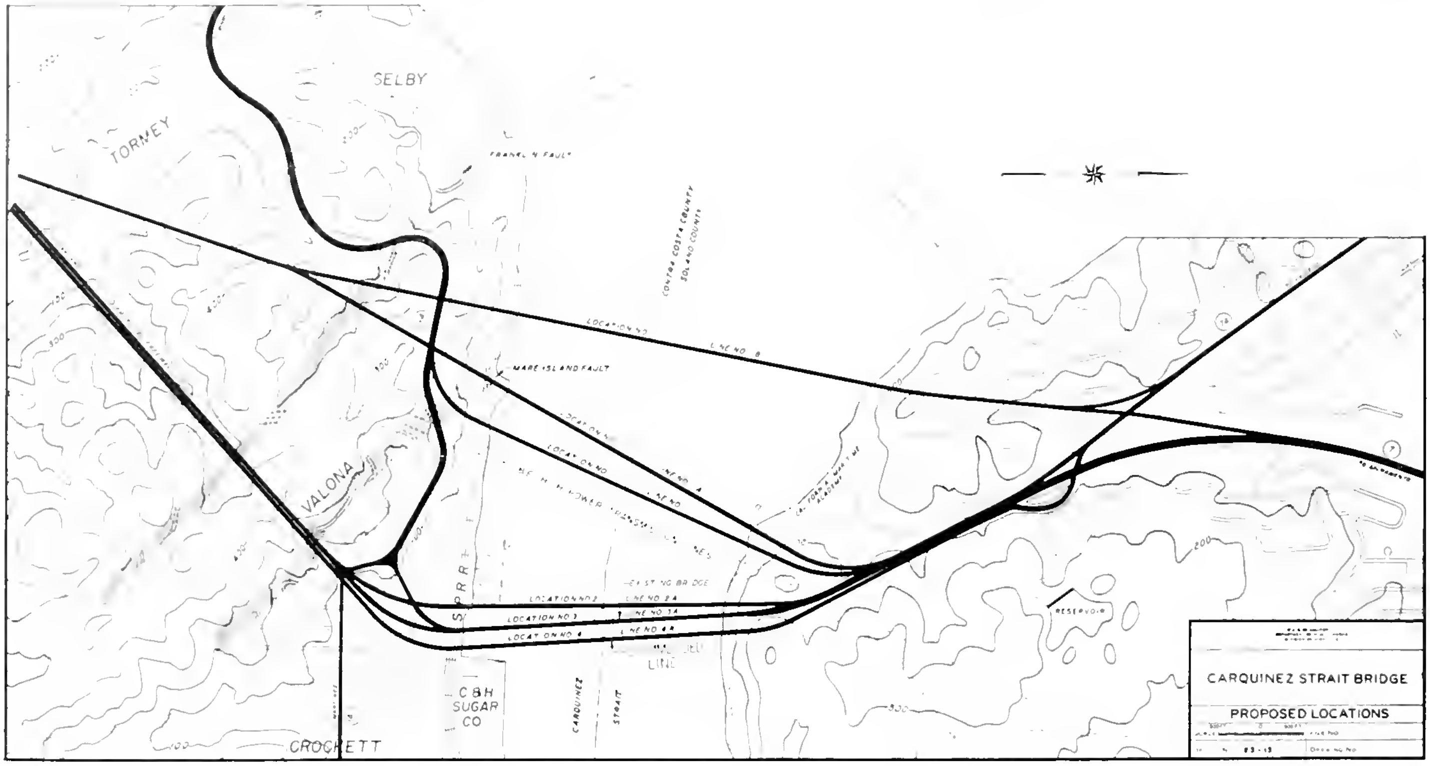
Two earthquake faults run through this area and the only other location seriously considered would have been jeopardized by the fact that the piers would have fallen on earthquake faults. The economy as well as the feasibility of getting approaches to the existing structure finally made it evident that a parallel bridge was the best solution. The possibility of using the existing bridge to carry the traffic in one direction also gave quite an economic benefit to this location.

Technical Advances

At first glance the new bridge will seem to be a twin of the old. The spans will be the same, the piers will adjoin each other. The height of the trusses and the panel length will be the same. Closer examination, however, will reveal many technical advances

Model of trusses and towers for ultimate development of the two parallel bridges at Carquinez Strait. At left, ultimate roadway of existing bridge; at right, new four-lane structure.



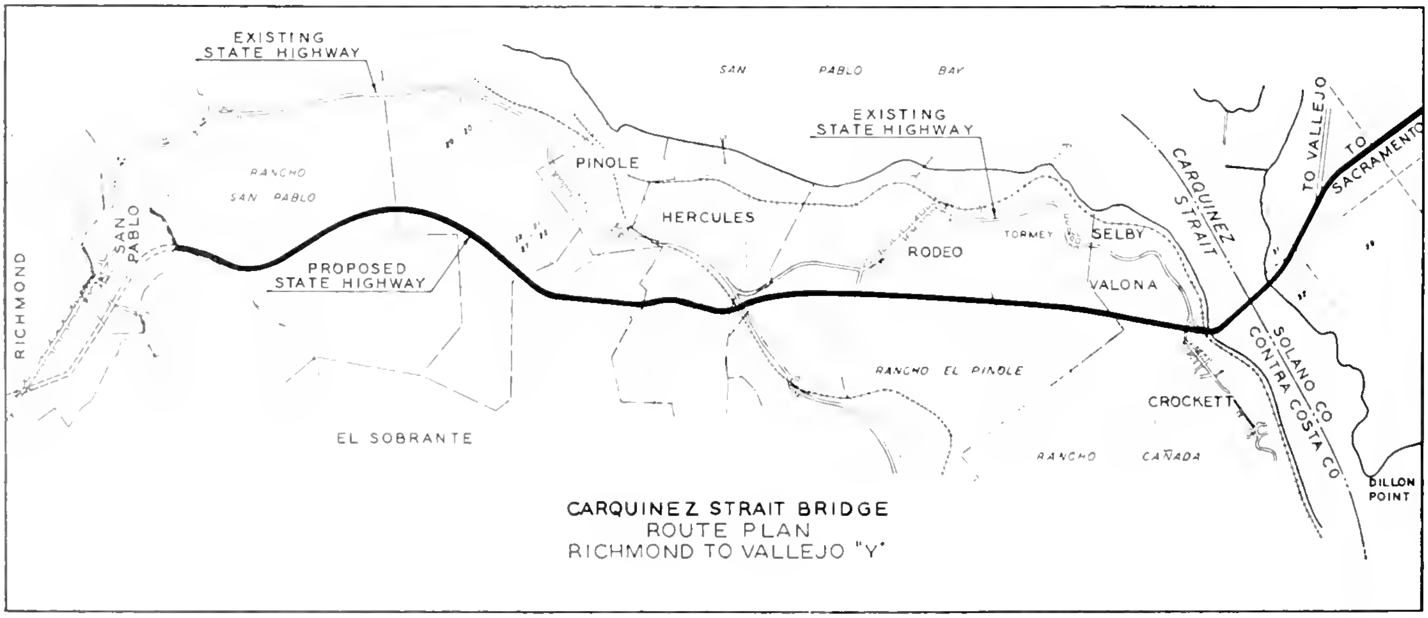


which have taken place over the past 30 years.

Welding will be extensively used and as a result the members will be cleaner and simpler than those in the old truss. This will make for easier fabrication and erection and will greatly ease the problems of painting and maintenance.

Some of the new alloy steels which have been developed in recent years will be used in the more highly stressed members. Some of these new steels have almost twice the strength of the steel used in the old structure. Easily welded and easily fabricated, the use of these new alloy steels will do much to make possible the streamlined appearance of the members in the new structure.

Another innovation will be the use of high strength bolts instead of field rivets. High strength bolts have proved their economy and usefulness and are being used more and more, especially for field connections of steel structures. The high strength bolts require less labor to place than rivets and the resulting connection is more rigid. After installation the bolts can be checked for the load they are carrying and a group can be evenly adjusted to spread the stress over the



Legislators who sponsored Carquinez Bridge bill view sketch of parallel Carquinez Bridge in Governor Knight's office just prior to signing by the Governor of the act. LEFT TO RIGHT—Director of Public Works Frank B. Durkee, Senator Luther E. Gibson, Vallejo; Senator George Miller, Jr., Richmond; Governor Knight, Assemblyman S. C. Masterson, El Cerrito; Assemblyman Donald D. Doyle, Lafayette, and Assemblyman Samuel R. Geddes, Napa.

entire connection. This completely eliminates the necessity of cutting out and redriving rivets which have been poorly driven or which have loosened after driving.

The increased strength of the new steel alloy makes it possible to reduce the number of pieces required to make up truss members. Whereas the existing truss members were made up of many plates and angles, requiring as many as 5 to 14 separate pieces, the members in the new design will be made up of three to five heavy plates in an H or a welded box section. The use of smaller members, because of the high strength steel, also is effective in reducing the secondary stresses in some of the larger cantilever members. The use of this alloy steel avoids a sort of vicious circle whereby heavier members cause greater secondary stresses which in turn require still heavier members.

Large Concrete Caissons

Three large concrete caissons, 53 feet by 102 feet in plan, similar to the type used on the San Francisco-Oakland Bay Bridge will be used at the three piers in the water. A new and heavy fender system has been designed to protect the piers in the channel. This fender is designed so that it can be put in place before the new piers are constructed, and used as a working platform during the locating and the sinking of the caissons.

One of the more difficult problems has been the location of the highway through the Valona Hills at the south end of the bridge. The hills are rugged, cut by many ravines, and the country is unstable so that a large number of slides and slipouts occur. These hills form a rather high barrier south of the bridge and are the cause of the present poor alignment. In order to achieve a satisfactory approach to the bridge from the south, it would be necessary to either tunnel through these hills or make some massive open cuts. Present plans call for an open cut up to 300 feet deep where the freeway passes through the highest part of the hills.

Because the approach to the south of the bridge takes off across new country, nearly four miles of new highway must be included as part of the over-all project. This will carry

. . . Continued on page 22

Revealing

Direct Benefits From Freeway Development

By PAUL O. HARDING, Assistant State Highway Engineer

A sufficient mileage of freeways for the Los Angeles metropolitan area now has been constructed and put into operation by the State Division of Highways so that direct benefits are quite universally recognized. These consist in the safe and expeditious movement of large volumes of public traffic. Accident records show that the life of a motorist on a full freeway is four to five times safer per mile of travel than on a conventional highway. Motorists using the freeways are also very much aware of the fact that driving the freeways is much less fatiguing than driving an equal mileage on congested city streets with frequent starts and stops at traffic signals and with the hazards of turning and cross traffic.

Freeways Attract Traffic

Because the freeways so greatly facilitate driving, an amazing thing has happened. Freeways are designed to serve through traffic and those motorists living in certain areas, and if only those motorists used the particular freeway who were theoretically expected to do so, we would have no freeway congestion. But, and this is important, we do not have at this time all the freeways that the Los Angeles metropolitan area needs, and many people living outside the theoretical service area of a freeway are attracted to it. Many times motorists drive miles out of their way to be able to utilize some of the completed freeways. This is the explanation for the utilization of the Hollywood Freeway by 168,000 vehicles daily. Who would have thought that when the Hollywood Freeway was opened that traffic on Riverside Drive—some two miles to the north—would be reduced by 34 percent and that traffic on Olympic Boulevard—some two miles to the south—would be reduced by 22 percent. It is this unexpected utilization of the Hollywood Freeway that has resulted in the present overcrowding. The Hollywood Freeway is not by any means "obsolete" as has been thoughtlessly charged; it is a modern up-to-date freeway in every sense of the word. It is, however, operating under an overload of approximately 50 percent in peak hours, and this creates difficulties.

The tremendous use being made of the completed freeways in the Los Angeles metropolitan area is a proof that the direct benefits therefrom are fully recognized by the traveling public. The direct benefits can be measured in dollars and cents. Figures have been developed by the Automobile Club of Southern California which prove that Los Angeles freeways are actually saving motorists some $50,000,000 per year already. This certainly is a substantial return on a total investment of some $15,0000,000 expended on the portions of the freeway system now in use.

City Streets Benefit

So much for the direct benefits. Now what are some of the indirect or by-product benefits? One of the first of these by-product benefits that comes to mind, resulting from freeway development in this Los Angeles area, is the relief that is provided in traffic congestion of city streets. It is obvious that as various units of freeway construction are completed and opened to traffic a very considerable number of motorists formerly using nearby city streets change their routes of travel so that they can use the freeways. A special study was made of the traffic situation along the Hollywood Freeway as various sections were completed and opened to traffic. It was found that the traffic load on all of the nearby east-west city streets were materially reduced. On Sunset Boulevard west of Figueroa Street 40 percent of the traffic was diverted. On Temple Street west of Boylston Street 48 percent of the traffic moved over to use the new freeway, and on First Street west of Figueroa Street the traffic was reduced 41 percent.

Certainly if we did not have at this time the network of completed freeways extending outward from the Los Angeles Civic Center the traffic congestion on the streets of downtown Los Angeles would be absolutely intolerable. And, in addition, there are further by-product benefits resulting from relief of congestion on city streets. Chief of these is the marked reduction in driving strain, which is certain to reduce traffic accidents.

Outlying Areas Develap

Another indirect benefit to city streets by reason of freeway construction is the development of outlying areas by subdivisions that provide additional residential housing, stores, schools and industries. One might say that such close-in areas as the San Fernando Valley would show the intensive development regardless of freeway construction, and this is more or less true because of the strategic location of this area. However, it can hardly be disputed that the development and completion of the Hollywood Freeway has, to a marked degree, stimulated the intensive development of the San Fernando Valley.

In the case of the phenomenal subdivision development to the east along the San Bernardino Freeway and to the southeast along the Santa Ana Freeway one cannot escape the conclusion that the present development of this land would not have been possible without the improved traffic service which these two freeways have provided. The thousands of new homes, stores, and schools that have been constructed in easterly and southeasterly portions of Los Angeles County and nearby sections of Orange County give evidence supporting this conclusion.

Economic Studies

In deciding upon a location for freeways and working out the design, economic studies are carried out in great detail. The cost of rights of way is balanced against the cost of construction so that the over-all cost will be the lowest possible to provide the traffic service necessary to meet the situation. This means that oftentimes a freeway will be located through the older sections of the city. Close-in sections of the Hollywood Freeway and the Santa Ana Freeway were through areas of the city of this character where many old buildings were removed in clearing the right of way. This has proved a great benefit because after the freeways have been built and put into operation and freeway planting carried out, the general tone of many neighborhoods has been so greatly improved that owners have been stimulated to renovate, reconstruct, and develop their properties which became enhanced in value because of proximity to the freeway.

Aesthetic Values Improve

Another important benefit resulting from construction of freeways is the pleasure that is incidental to the protective planting program carried out by the State Division of Highways in providing erosion control. The planting of shrubs, trees and ground cover along California freeways is primarily a matter of safety and economy through the control against devastating erosion.

The Pasadena Freeway in the Arroyo Seco is one of the best examples of multiple-purpose planting. The thick green ground cover which hugs the cut slopes along this famous freeway, while appreciated for its ornamental value, was actually planted for erosion, weed and fire control.

Similarly, the ice plant on the slopes of the Atlantic Boulevard interchange on the Santa Ana Freeway is there because it will save thousands of dollars in maintenance costs. The "landscaping" effect is actually a byproduct.

Beautification Contests

Los Angeles Beautiful, an affiliate of the Los Angeles Chamber of Commerce, last year conducted a citywide contest for outstanding planting projects. There were 12 classifications set up in the completion, including one for freeways and highways, with four prizes in each classification. The first three prizes in the freeways and highways classification were awarded to State Highway projects.

The section of the Hollywood Freeway between Grand Avenue and Glendale Boulevard, which includes the four-level traffic interchange structure, won first place. Planting on this section is probably closer to landscaping of the beautification type than anywhere else on the State Highway System, and was designed in accordance with the desires of Los Angeles city authorities as well as in keeping with the importance of the four-level structure as the hub of a metropolitan freeway system. It was planted in 1950 and 1951, and includes grass, ground cover, shrubs and trees.

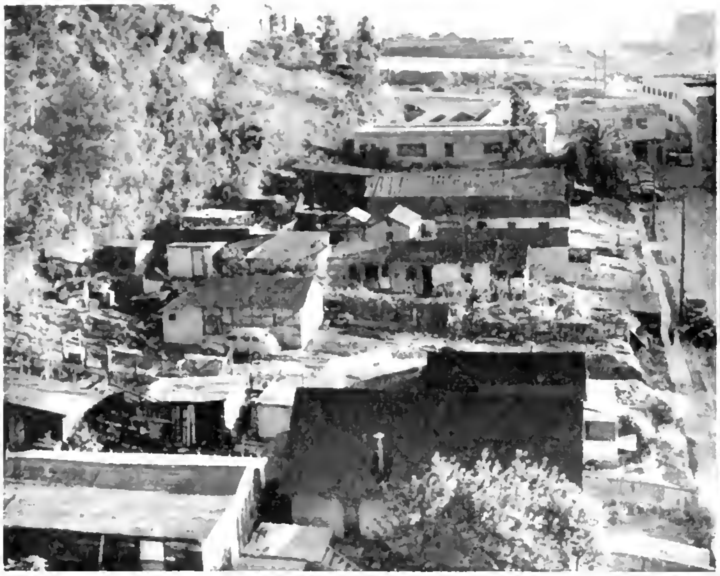
Second prize went to the Pasadena Freeway, planted between 1940 and 1948, and third to the section of the Hollywood Freeway between Glendale Boulevard and Western Avenue, planted in 1952 and 1953, both featuring the ivy and iceplant ground cover.

The freeway planting was designed by H. Dana Bowers, Supervising Landscape Architect of the Sacramento staff of the Division of Highways, and is maintained by District VII maintenance crews under the supervision of A. L. Olmsted, District Highway Landscaping Supervisor.

Further Freeway Benefits

Perhaps the greatest by-product benefit resulting in the Los Angeles area from the construction of freeways is the improvement of park areas made at the time the freeways are being built. It has been claimed by some that the State Division of Highways seeks out the flat, level areas in city park lands and builds freeways thereon because it is cheaper and easier than locating the freeways elsewhere. Flat, level areas are not necessarily always the cheapest to build on. Actually the ideal location for a free-

LEFT—Looking northeasterly along Arroyo Seco Freeway location toward City of South Pasadena in background. Photo taken in 1940. RIGHT—Photo taken at same location in May, 1955.



LEFT—Looking southerly along Santa Ana Freeway location from Sixth Street Bridge. Note Sears Roebuck Building on East Olympic Boulevard shown in background. Photo taken 1941. RIGHT—Photo taken at same location in 1955.

way would be where topography is slightly rolling so that cross streets could be constructed under the freeway in valleys and over the freeway on ridges. If the valleys and ridges were of proper size and ideally located, the freeway excavation would then just equal the amount needed for freeway embankment and the hauling costs would thus be reduced to a minimum. Of course, these ideal conditions cannot be met although the topography of the country passed through does exert a great influence on the design. It is very doubtful if the four-level traffic interchange structure at the crossing point of freeways west of the Los Angeles Civic Center would ever have been built were it not that favorable topographic features made it a natural development in keeping with the local conditions.

It should also be called to mind when there is criticism of freeways being located through city parks that the original concept was that freeways were roads through parks and they were and still are called "parkways." The Master Plan of Freeways of the County of Los Angeles, with only two or three exceptions, designates all of the freeways as "parkways."

Access Rights Essential

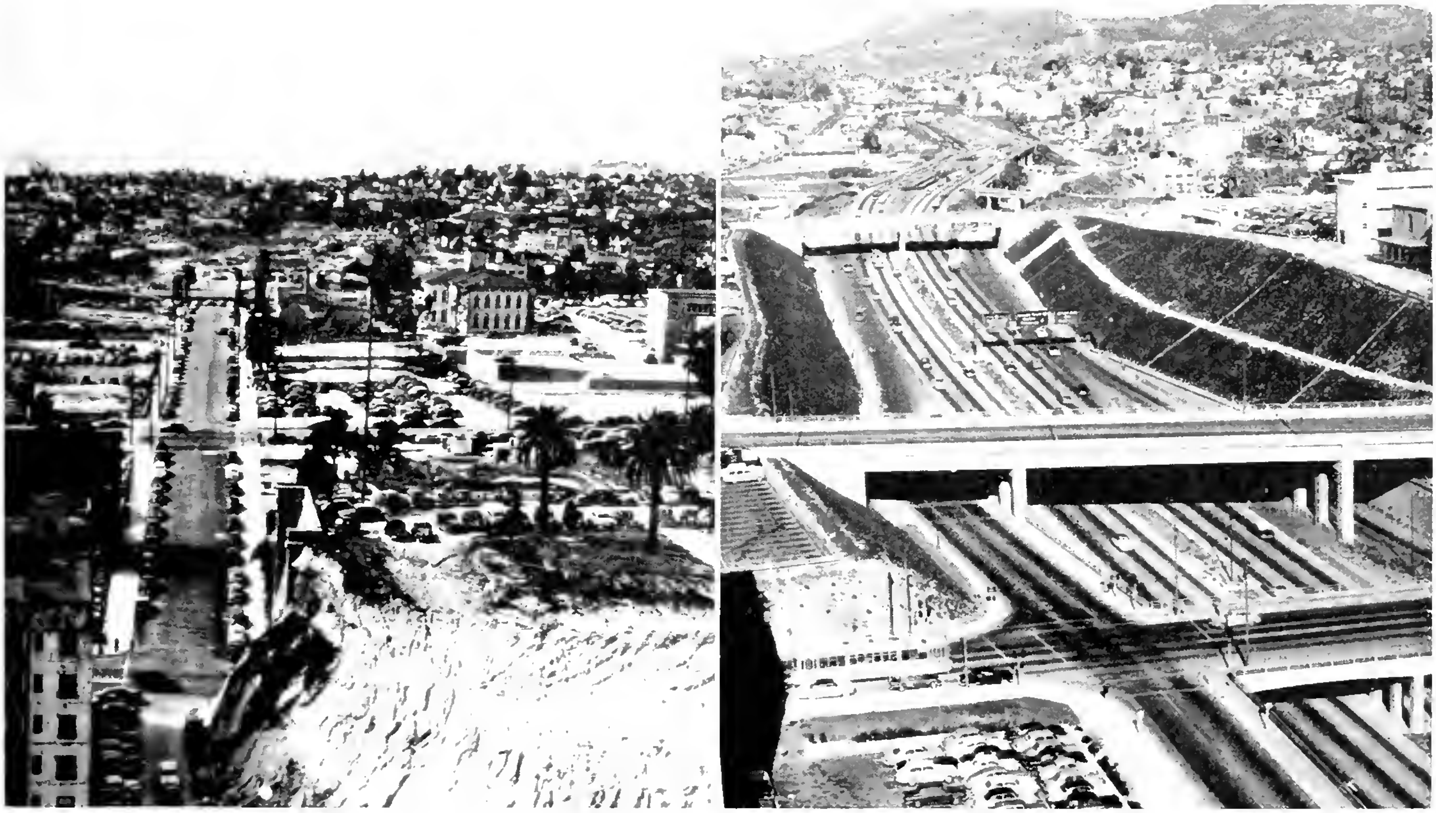
Probably the original conception of freeways being parkways originated from the fact that a freeway requires the taking of all rights of ingress and egress from abutting property and it was first thought that such highways should be located through park lands where these access rights of abutting property were not needed. Then the idea developed that when no park lands existed wide areas of land should

LEFT—Looking westerly from near Rosemont Avenue along Hollywood Freeway location before construction and while buildings were being moved to clear right of way. Temple Hospital in left background. RIGHT—Photo taken at same location in May, 1955.

be purchased so that park areas could be created on both sides of the highway. The principle of buying out ingress and egress rights from private property owners was a later legal development without which the building of freeways as we now know them would have been impossible.

If we are to have the freeways needed for this area, construction must sometimes be carried out through public parks lands when the proper solution to the freeway problem so dictates, with very careful consideration naturally given to preserving or rehabilitating existing recreational facilities. The Pasadena Freeway passed through park lands in the Arroyo Seco of the City of Los Angeles and the City of South Pasadena. Much of the park land area taken by the Pasadena Freeway was boulder-strewn river bottom land that was periodically subject to overflow. The building of the Pasadena Freeway, along with the WPA construction of a lined channel for the Arroyo Seco stream, gave these public park lands definition and facilitated future development of adequate recreational facilities for the area.

In connection with the original agreement entered into between the State and the City of Los Angeles regarding city park lands in the Arroyo Seco it was specified that a certain park bridge for pedestrians should be built over the stream channel whenever the later need for it developed. In accordance with this agreement this bridge, in the vicinity of Avenue 58, was completed in June, 1951, at a cost of $30,000. It is interesting to note that this bridge has attracted nation-wide attention because it is the first prestressed reinforced concrete bridge to be built by the State Division of Highways in Southern California.



LEFT—Looking westerly from Federal Building in Los Angeles Civic Center before construction of Hollywood Freeway. Taken in 1948. Los Angeles City Board of Education Administrative Office Buildings shown at right. RIGHT—Showing completed Hollywood Freeway. Photo taken in May, 1955.

Elysian Park Benefits

The section of the Pasadena Freeway between the Los Angeles River and Castellar Street passed through Elysian Park. Many construction features were incorporated in the freeway construction that were of great benefit to this city park. Along the freeway itself ornamental stone walls were constructed with pedestrian walkways which for safety were fenced off from the main freeway. A beautifully designed arch bridge was constructed over the freeway at Park Road in order to provide vehicular connection between portions of the city park lands east and west of the freeway. Some 2½ miles of park roads were graded and surfaced as part of the freeway construction contract in order to provide adequate communication between other park areas. Excess excavation from the freeway was also hauled considerable distances into Elysian Park in order to fill up deep unusable canyon bottoms and washes to provide flat areas for planting of trees and installation of recreational facilities. The excavation and embankment slopes along the freeway through the park were planted with trees and shrubbery by the State Division of Highways. All things considered, the area in Elysian Park which was affected by the Pasadena Freeway construction was improved rather than damaged by the freeway construction.

Echo Park Improvements

The Hollywood Freeway location westerly of the Los Angeles Civic Center between Bellevue Avenue and Temple Street, of necessity, had to pass through a portion of Echo Park. This could ony have been avoided by putting additional curvature into the freeway location and by involving the expenditure of large additional sums for right of way acquisition in the taking of homes, apartment houses, and store buildings. Under agreement with the City of Los Angeles the State provided as a part of its right of way acquisition program in connection with the freeway enough additional land for the park department to offset the area which was needed for the freeway. The State then went ahead and reconstructed the playground facilities in the path of the freeway. Among these was a baseball diamond complete with bleachers and lighting facilities for nighttime baseball games. The new playground facilities as finally reconstructed were considerably superior to the old ones that were replaced.

About three years ago when plans were being completed for the Colorado Freeway construction in the Eagle Rock area, negotiations were entered into with the Department of Recreation and Parks of the City of Los Angeles relative to freeway construction through the Eagle Rock playground area. Amicable agreement was reached between the city and the State that has resulted in mutual advantage to both parties. Among other matters the State agreed, as directed by the city, to build up low areas of park land by dumping thereon excess excavation from the freeway. To date, with more to come, some 65,000 cubic yards of material have been hauled from the freeway excavation and utilized to fill in low areas on the park land which will later on be developed by the City Department of Recreation and Parks into tennis courts, baseball diamonds and other recreational facilities. This is another instance where city park lands have been actually improved by freeway construction.

This photo shows section of completed Balboa Freeway in San Diego

Parks Are Compensated

These details are mentioned in order to acquaint the public with the fact that when a state freeway goes through public park land the people are not permanently deprived of their recreational facilities. They can rest assured that at any future time when the State finds it necessary to construct a freeway through other public park land that equal consideration will be shown, and in the final analysis the parks will be benefited rather than damaged by freeway development.

In this connection there is still another beneficial by-product of freeways through park areas which should not be overlooked. It has been found that freeways tend to open up brand new vistas of hitherto unsuspected beauty in the local landscape. The pleasurable ride through Balboa Park on the Cabrillo Freeway in San Diego is a case in point. Far from damaging the scenic and recreational values of a park, a freeway is more likely to enhance its attractiveness to the public as a whole.

There is no disputing the fact that freeway development through a metropolitan area has a terrific impact on the communities passed through. Literally thousands of people have their homes, their businesses and their institutions torn up by the roots. Money payments to owners based on fair market value for property taken cannot always compensate some individuals for sentimental attachments. The freeway construction program goes forward on the premise that there is accomplished "a greater good for a greater number." Direct benefits are widely recognized but there are many by-product benefits from freeways that are sometimes overlooked and need to be specifically pointed out. The public generally speaking appears to be sold on the freeways. This is proven by the tremendous use of those freeways that have been completed.

The State has a mandate from the people to construct more freeways, and the main duty of its engineers charged with responsibility for the freeway program is to see that every dollar of the people's money for freeways is spent judiciously to give the highest possible return on the investment to the public which it serves.

Skyways

Multimillion-dollar Section Of Bayshore Freeway Opened

San Francisco on June 14th officially celebrated the completion of the final link in $23,000,000 worth of skyway approaches to the San Francisco-Oakland Bay Bridge.

Ribbon cutting ceremonies were presided over by Thomas J. Mellon, President of the San Francisco Chamber of Commerce, which sponsored the opening of the new freeway. Mellon, after reading a message from Governor Goodwin J. Knight, introduced the following speakers: Thomas A. Maloney, Speaker pro Tempore of the State Assembly; George J. Christopher, President of the San Francisco Board of Supervisors; Frank B. Durkee, Director of Public Works; Thomas A. Brooks, Chief Administrative Officer of San Francisco; R. M. Gillis, Deputy State Highway Engineer; B. W. Booker, Assistant State Highway Engineer, under whose direction the new freeway approaches were constructed; C. M. Corbit, Regional Engineer of American Institute of Steel Construction and F. W. Panhorst, Assistant State Highway Engineer, who is chief of the Bridge Department of the Division of Highways.

B. W. BOOKER
Builder of Skyways

On behalf of the American Institute of Steel Construction, Corbit presented to Panhorst a plaque awarded for beauty of design of the overhead freeway. Wendell Pond, Senior Bridge Engineer of the Division of Highways, designed the structure.

Following the speech making, Public Works Director Durkee took care of the ribbon cutting which signalized the opening of the new freeway to traffic.

Coincident with this ceremony, final stages of work on a five-mile section of Bayshore Freeway from Sixteenth Avenue in San Mateo to San Carlos were completed.

This six-lane freeway project was constructed at a cost of $5,859,778, including right of way acquisition, provides interchanges at Nineteenth Avenue and Hillsdale Boulevard in San Mateo, Ralston Avenue in Belmont and Holly Street in San Carlos.

While the completed project provides six freeway lanes initially, the facility has been constructed with a wide median which will accommodate an additional lane in each direction when conditions warrant the expansion.

The opening of this five-mile stretch results in a total length of 16.4 miles of continuous freeway now in operation along the Bayshore route in San Mateo County.

Completion of Downtown Section

The opening of the connection for eastbound traffic from the San Fran-

THOMAS A. BROOKS

ASSEMBLYMAN THOMAS A. MALONEY

SUPERVISOR GEORGE J. CHRISTOPHER

Surrounded by four contestants for the title of Miss San Francisco, Director of Public Works Frank B. Durkee snips ribbon. Officials, left to right, are: C. A. Maghetti, Secretary, California Highway Commission; George J. Christopher, President, San Francisco Board of Supervisors; Highway Commissioner F. Walter Sandelin; Durkee; Thomas J. Mellan, President, San Francisco Chamber of Commerce; Assemblyman Thomas A. Moloney.

DEPUTY STATE HIGHWAY ENGINEER
R. M. GILLIS

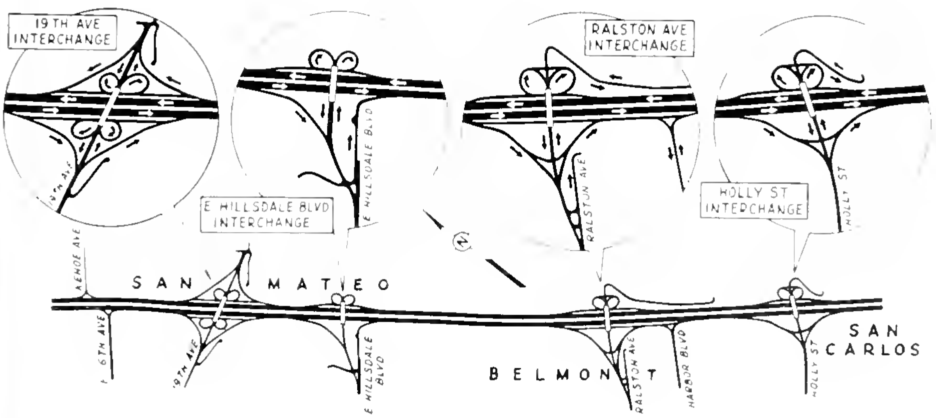
LEFT—View of recently completed five-mile section of Bayshore Freeway between San Mateo and San Carlos. Holly Street Interchange at San Carlos in foreground. RIGHT—View of recently completed section of Bayshore Freeway in San Mateo. Tenth Avenue Interchange in foreground.

cisco Skyway to the Bay Bridge on June 14th marked the completion of the downtown end of the Bayshore Freeway. The eastbound connection from the Central Freeway and the on-ramp at Eighth Street and Bryant Street were opened at the same time.

Work on the Bayshore Freeway from Alemany Boulevard to Army Street was started in June, 1949. This one-mile section was completed in June, 1951. The northerly continuation of the original section which extended the facility to ramps connecting with Bryant Street at Ninth and Tenth Streets was opened to traffic in October, 1953. In July, 1954, the next unit which extended the freeway to Seventh Street was placed into service.

On March 1st of this year the first unit of the Central Freeway which branches from the Bayshore at Division Street extended to skyway in a westerly direction to Mission Street. This was followed by the opening of the southward extension of the Bayshore Freeway from Alemany Boulevard to Third Street on March 30th.

Then on May 26th a downtown extension of the freeway from Eighth Street to Fourth Street was opened. Thus, after a six-year period of concerted effort representing a construction expenditure of $23,000,000, a total length of six miles of modern highway facility is now serving motorists in San Francisco.



Opening Significant

While the connecting link with the Bay Bridge is sandwiched in along the previously completed unit and as such does not add to the length of the completed freeway network, the opening of this final unit of the Bayshore is significant. For the first time, a substantial number of vehicles approaching or leaving the Bay Bridge were able to make full use of the freeway, thus affording a substantial measure of relief from traffic congestion for streets in the downtown, south of Market, area.

Aerial photo of Bayshore Freeway approach to San Francisco-Oakland Bay Bridge. Left foreground is 13th Street connection to Mission Street. In right foreground is Bayshore Freeway leading south. In the center is the new connection to the Bay Bridge.

The engineering achievement in providing an artery of high utility from a traffic standpoint also added to the aesthetic qualities of the metropolis. The elevated roadways of the freeway in San Francisco afford motorists an excellent opportunity to view the splendor of her world-famous skyline as they approach the central district of the city. The magnificence of the view has appropriately led to the local designation of the elevated freeway system as skyways.

Project Wins Award

To complement the beauty of the vista from the roadway of the skyway structures the construction has attained distinction in yet another manner. The unit of the viaduct first to be finished which terminated with ramps connecting to Ninth and Tenth Streets at Bryant Street was judged by the American Institute of Steel Construction to be the most beautiful Class II steel bridge opened in 1954. This award was on the occasion of an annual nation-wide competition which includes bridges costing over $500,000 and having no span over 400 feet.

UPPER—Wendell F. Pond, who designed the Bayshore Freeway Bridge, shows President Mellon of San Francisco Chamber of Commerce the plaque presented to F. W. Panhorst, Bridge Engineer, by the American Institute of Steel Construction. LOWER—Official caravan stops on new Bay Bridge approach for ribbon-cutting ceremony.

Presentation of a stainless steel plaque to the Division of Highways by the American Institute of Steel Construction was made during the opening ceremonies.

With the completion of the San Francisco terminus of the Bayshore Freeway accomplished, work is already under way on the eastward extension of the skyway which will be known as the Embarcadero Freeway. On the westerly fringe of the central district, preparation of plans and acquisition of rights of way are being pressed for the continuation of the Central Freeway. Meanwhile, studies are under way by the engineering staffs of the Division of Highways and the City of San Francisco for additional freeway facilities which, when completed, will result in an integrated modern transportation network in San Francisco.

In Lake County

Two Major Improvement Projects Are Under Way

By W. R. LOVERING, District Materials Engineer

IMPORTANT improvement of Sign Route 20 in Lake County is progressing rapidly.

The present construction actually involves two projects: (1) relocation of State Sign Route 20 between Laurel Dell Lake and 0.4 mile west of Tule Lake, and (2) the raising of the Tule Lake fill necessitated by subsidence of the foundation.

The relocation will improve 2.3 miles of state highway that contained 14 curves unsafe for speeds of 40 miles per hour, and 3 curves unsafe for speeds of 30 miles per hour. The present road, built in 1922-23, follows the edge of Laurel Dell Lake and then skirts the narrow valley of Scotts Creek. The improved alignment follows essentially the same location but maintains a modern standard by shifting Scotts Creek and crossing the valley floor where necessary. The new alignment will permit speeds up to 60 miles per hour.

Huge Fill Required

Relocation along Laurel Dell Lake will require a fill about 30 feet high, above the present level of the lake bottom, across a small bay. Borings at this location indicated a very soft peat and lay formation to a depth of 15 to 30 feet. The test data indicated that this material would not support the fill. Because of the difficulty of stripping the mud, which is below the water level of the lake, it was decided to build the fill outward from the bank so that the mud would be displaced as the fill was constructed.

Near the Scott Valley road connection a fill of 20 feet to 25 feet is required over soft lake bed deposits. At this location a blanket of pervious gravel was placed over the foundation soils before constructing the fill. This will permit the escape of water forced from the soils by consolidation under the weight of the fill. Settlement platforms have also been installed to permit a continuous check on the rate of settlement to serve as a guide in controlling the rate of fill placement.

Tule Lake Fill

When the Tule Lake fill project was being designed, an investigation by Headquarters Laboratory of the Division of Highways indicated a depth of about 80 feet of unconsolidated lake bed soils, with high moisture content, through the Tule Lake area. The estimated cost of treatment of these materials to obtain rapid consolidation, and thus prevent later settlement of the completed fill, proved

Looking westerly along shores of Laurel Dell Lake in Lake County at the big cuts near westerly end of the Laurel Dell-Tule Lake project. New embankment extends in foreground across small bay of lake.

LEFT—Looking easterly along shores of Laurel Dell-Tule Lake project. Note sharp, narrow turn on old highway that will be superseded by new, modern alignment. RIGHT—Looking westerly along new grade on the Laurel Dell-Tule Lake project. New alignment replaces narrow, winding old highway which turns off to right and follows along base of hills forming the Scotts Creek Canyon.

to be higher than periodic rebuilding of the fill to correct for settlement.

Based on these data, it was decided to build the fill without special foundation treatment, except counterweights of strut fills to prevent complete failure, and plan on additional increments of fill at periods of 5 to 10 years as settlement occurred.

The present additions to the fill are the first in the planned stage construction. It is expected that others will be required.

J. E. Stinson is the construction superintendent for the Granite Construction Company. The resident engineer for the State is P. A. Main.

Early History

From its first occupation in 1840, when Salvador Vallejo brought cattle into the Lake County area and built a log house and corral near the present location of Kelseyville, Lake County has been handicapped by lack of adequate facilities for transportation. Although construction was started on several railroad lines into the area, none were completed and to this day there are no railroads in the county.

The first roads were constructed from the south via Napa County, followed by two roads from Cloverdale—the Dodson Road, built in 1865, and the Matt Lea Toll Road, built in 1877. In 1890 all roads into the county were privately owned. The Blue Lakes Toll Road, which connected Upper Lake and Ukiah, was purchased and made a free road in 1896, and became the first publicly owned road into Lake County.

Early travel consisted principally of vacationists from the more densely settled regions visiting these mineral springs and resort areas. These many natural mineral springs were first used by the Indians before the arrival of white men and were later developed into resort areas which still attract a large number of vacationists.

Blue Lakes was a well-known resort area as early as 1880 and, in 1900, the hotel at Laurel Dell was built by Henry Wambold. Henry Wambold has also been credited with introducing bean canning into the area and with starting the reclamation of Tule Lake, which has since proved to be ideally suited to the culture of beans as a commercial crop.[1]

Importance of State Highway

Vacationist travel is still an important part of the total highway travel, but an adequate highway system is a necessity also for marketing the pear and walnut crops and for importing the commodities necessary for the production of these crops, and for the needs of the county's residents.

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[1] "History of Mendocino and Lake Counties" by Aurelius O. Carpenter and Percy H. Millberry (1914).

Looking westerly at construction activities on Laurel Dell-Tule Lake project in Lake County at intersection with Scotts Valley Road and at easterly end of Laurel Dell Lake.

State Sign Route 20 is the only reasonably adequate route available for through east-west traffic in the 200 miles between the San Francisco Bay area to the south and the Eureka-Redding road to the north. In addition to the service to through traffic between the lower Sacramento Valley and the north California coastal area, the route furnishes practically the only northerly access to the county.

From a casual inspection it would appear that the construction of a modern highway through the Blue Lakes region would involve no serious problems. A more comprehensive study, however, shows that the foundation furnished by the relatively flat valleys is far from stable and even the lowest of fills cause consolidation or settlement of the foundation. This condition has been brought about by the geologic changes that have resulted in the formation of the Blue Lakes.

Geology of the Blue Lakes

One of the earliest attempts to explain the geology of Lake County is contained in a Pomos Indian legend recounted by Carpenter and Millberry in their book "History of Mendocino and Lake Counties."

"Konocti was a proud and powerful chief, with a beautiful daughter, Lupiyomi. His rival was a young chief named Kah-bel, who loved Lupiyomi, and his passion was reciprocated. Konocti refused his consent to their marriage and was challenged to battle by Kah-bel. On either side of the Narrows of Clear Lake the mighty chiefs took their stand and hurled rocks at each other across the water. The Indian narrator, in support of this legend, points to the immense boulders strewn to this day over these mountain sides. The Indian girl grieved over the deadly contest; and Little Borax Lake, intensely impregnated with mineral, attests to her bitter tears. Kah-bel was killed and his blood is now seen in the red splashes on the gashed side of Red Hill, on the north shore of the Narrows. But old Chief Konocti also succumbed to his wounds and sank back to form the rugged volcanic rock pile which bears his name. The maiden Lupiyomi was so distraught over the death of both her lover and her father she threw herself into the lake and her unfailing tears now bubble up in the big soda spring, Omarocharbe, which gushes out of the waters of Clear Lake at Soda Bay."

Perhaps an Inland Sea

This legend explains many of the features of the county but leaves much to be desired in the way of substantiating data. The first clue to the formation of the Blue Lakes is contained in a report published in 1908 by J. O. Snyder, in which he noted the similarity of the fish fauna of the Russian River with that of the tributaries of the Sacramento River and concluded that they were derived from the Sacramento.

The past 100,000,000 years in the geologic history of the Lake County region has been essentially a period of subsidence. As the region sank, erosion from adjacent higher land filled the depressed area with sediments which accumulated to fantastic depths. From these sediments came the shale and sandstone rocks which form the majority of the hills and ridges in the county. During this early period the Clear Lake region was either an inland sea or a depressed area with drainage possibly both to the east and west.

In more recent geologic time, volcanic activity has disturbed the older sedimentary rocks and has resulted in lava flows and the formation of such mountains as Konocti.

Lava Flows and Erosion

One of the small lava flows apparently crossed the southern outlet of Cold Creek.

Clear Lake and effectively dammed this outlet. This resulted in a rise in

. . . Continued on page 21

Major Arterial

State, County and City Funds Combined To Construct Park Boulevard

By JOHN A. MORIN, City Engineer, City of Oakland

MANY years ago it became evident that old county road No. 625, known as Park Boulevard, running between MacArthur Boulevard (State Highway Route 5) and Mountain Boulevard (State Highway Route 227) would be inadequate. Originally improved between 1907 and 1912, the area had been built up along the the original alignment and Oakland was faced with the problem of accumulating over a million and a quarter dollars in order to acquire additional rights of way and improve this facility between MacArthur Boulevard and Estates Drive (1.40 miles) to modern standards. Beginning in 1939, the City of Oakland started setting aside a $50,000 yearly allotment of its gas tax funds for this project and, also, included a portion of the project in the 1945 bond issue.

When it became evident that actual construction could be started, the Alameda County Board of Supervisors was approached and, as this major street is of county-wide importance, that board contributed a total of $110,000 toward construction. The City of Oakland contributed $365,909.78 bond issue money, $339,329.64 of which was for right of way and the balance was used for the construction of sidewalks, lighting, drainage, and other features which are not eligible for gas tax funds, but which are necessary to complete a project in an urban area. The remainder of the cost, $855,038.53, was derived from gas tax funds.

Breakdown of Cost

The following breakdown of the total cost indicates the high cost of rights of way on this type of project and the reason why such projects are difficult in the urban areas:

Construction	$747,132.51
Rights of way	583,815.80
Total	$1,330,948.31

Photograph of the completed improvement at the intersection of Park Boulevard and Leimert Avenue looking northeasterly

Considerable savings in right of way costs were made possible by the early beginning of right of way acquisition and through the policy of purchasing entire lots and selling the remaining parcels after construction rather than purchasing portions of lots and paying high severance costs and damages.

It was necessary to design this major arterial with a median strip and four traffic lanes as it is a direct connection between the proposed Shepherd Canyon Tunnel to Contra Costa County and Oakland's central business district, as well as a connecting link between the interchange structure on the Mountain Boulevard Freeway and the interchange structure on the MacArthur Boulevard Freeway. Parking lanes, sidewalks and improved lighting were necessary as the route traverses a highly developed business and multiple home area. Major changes in alignment made it necessary to move three multiple-story apartment buildings, 35 homes and one store.

In order to eliminate an undesirable bend in the old alignment it was necessary to close two streets and change the traffic pattern immediately north of MacArthur Boulevard. A second undesirable bend was eliminated between El Centro Avenue and Hollywood Avenue and the extra street area utilized for planting. Changing the alignment and grade at this point made through access from San Luis Avenue impossible and, as this was a dead-end street, it was necessary to construct a parallel access street between San Luis Avenue and Dolores Avenue.

The widened section at the intersection of Leimert Boulevard, where left-hand turn slots and traffic signals are provided, has removed a bottleneck that had long plagued commuters. It is planned to construct six lanes to complete the remaining link between Mountain Boulevard interchange and Leimert Boulevard when traffic warrants, but the four lanes now provided are sufficient for present-day traffic.

The accompanying cross section shows the pavement design. The underlying basement soil proved to have a large percentage of clay con-

Aerial view of Park Boulevard from Excelsior Avenue to Estates Drive. Foreground shows beginning of one mile of concrete pavement; upper 0.4 mile of pavement is asphaltic concrete.

SUMMARY OF COSTS—IMPROVEMENT OF PARK BOULEVARD

		Costs			Financing		
	Miles	Right of way	Construction	Total	City funds	Alameda County funds	Gas tax funds
1st Unit—Greenwood Avenue			$234,269.91		$26,580.14		$207,689.77
to El Centro Avenue	0.70			$234,269.91			
2d Unit—Excelsior Boulevard to		$263,168.97			48,866.57		214,302.40
Greenwood Avenue	.28		290,463.07		290,463.07		
				553,632.04			
3d Unit—El Centro Avenue to		320,646.83					320,646.83
Estates Drive	.42		222,399.53			$110,000	112,399.53
				543,046.36			
Totals	1.40	$583,815.80	$747,132.51	$1,330,948.31	$365,909.78	$110,000	$855,038.53

Construction of first unit started August 22, 1949.
Completion of third unit was April 6, 1955.

taining considerable ground water and accounts for the heavy sections used.

This project was a costly undertaking but has since proved its worth for traffic as well as generally enhancing the neighborhood. All of the old structures were remodeled and improved and new buildings are being constructed along the new alignment. The appearance of the neighborhood has materially improved and new buildings are being added to the tax rolls. Such projects fit in well with the efforts being made by the cities toward urban renewal.

Fine Cooperation

Much credit for the success of this project goes to the fine cooperation received from the various state and county officials and from the utility companies involved. New gas, water, electric and telephone lines were installed with a minimum delay and inconvenience. B. W. Booker, Assistant State Highway Engineer for District IV, and his staff provided excellent technical advice, and Fred Montell, a member of his staff in charge of city cooperative projects, cooperated in planning and financing to the extent that all plans were approved without delay or changes.

The Alameda County Board of Supervisors' assistance in the financing made it possible to construct this project on schedule. All plans were prepared in the office of the city engineer under the immediate supervision of F. W. Zeigler, Assistant City Engineer, and James C. Barrett, Supervising Civil Engineer. Financing details were made by Emil Kaleschke, Supervising Civil Engineer.

DON'T FOLLOW TOO CLOSELY

By far the main cause of rear-end collisions is following the vehicle ahead too closely. This fault is one of which many otherwise careful drivers are guilty. The heavy traffic on freeways and congested city streets leads many motorists to hug the bumper of the car ahead. Don't do it! Allow plenty of room for quick stops and it will save you the cost and confusion of this common highway mishap.

LAKE COUNTY

Continued from page 18 . . .

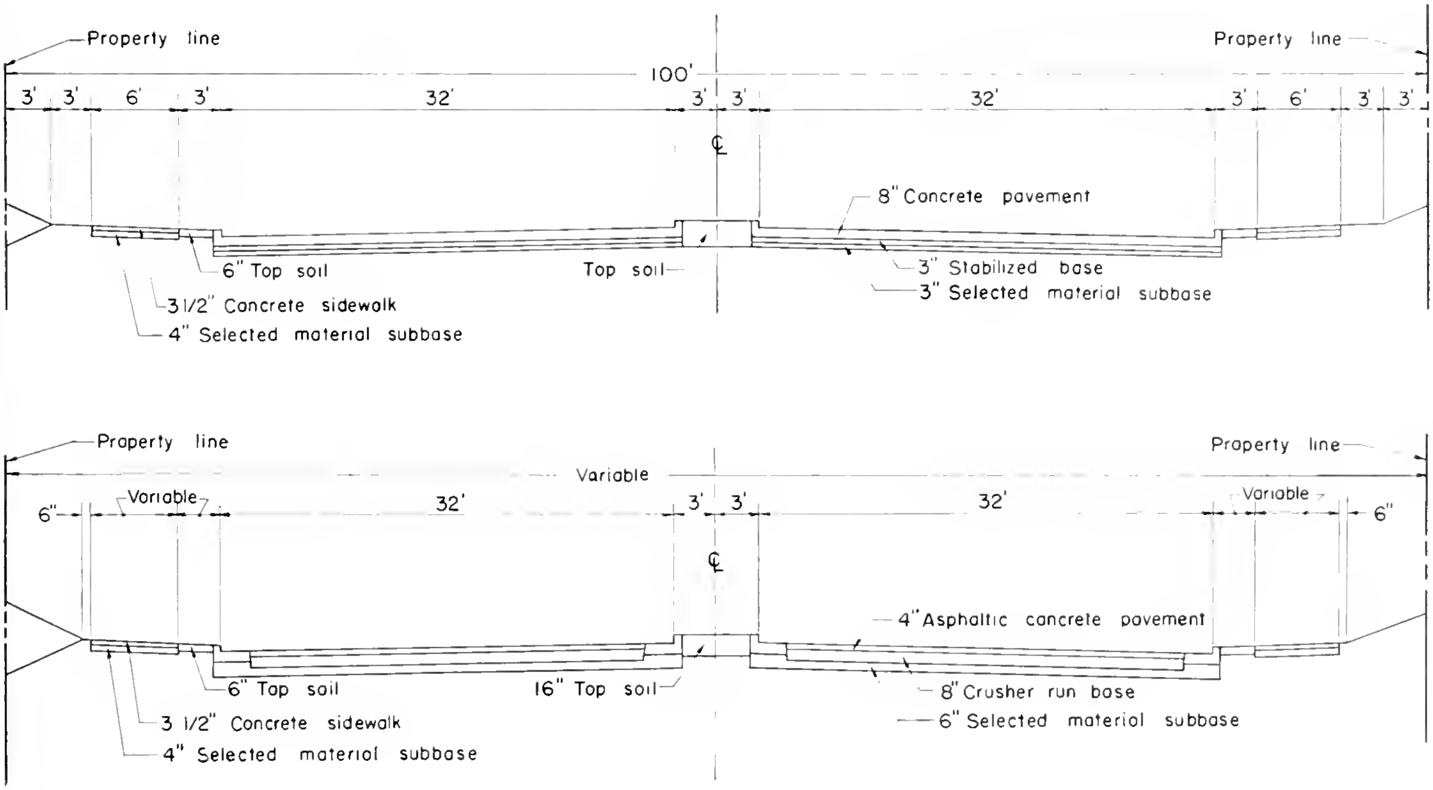
the level of the lake which eventually became high enough for the entire lake to drain to the north through Cold Creek.

The resulting erosion of the Cold Creek gorge caused landslides which either dammed or partially dammed the outlet, causing further fluctuations in the lake level. The most recent of the landslides completely dammed the Cold Creek outlet and caused the lake to rise until it topped the lava flow across the southern outlet. Eventually the lava flow was eroded through and, with the southern drainage re-established, Clear Lake receded to approximately its present level.

During this period, however, the delta from Scotts Creek separated the Blue Lakes from Clear Lake and, together with wet weather, streams in the area formed lake bed deposits of fine, poorly consolidated material varying in depth to 100 feet or more.[2]

[2] "The Lakes of California" by William Morris Davis, California Journal of Mines and Geology, January-April, 1953, Vol. 29, Nos. 1 and 2.

UPPER—Typical cross section of concrete pavement. LOWER—Typical cross section of asphaltic concrete pavement.



Pedestrian Crosswalks Near Schools Will Be Repainted Yellow

All pedestrian crosswalks on state highways in the vicinity of schools will be repainted yellow as a result of a bill passed by the 1955 Legislature and signed into law by Governor Goodwin J. Knight, the Division of Highways has announced.

At present school crosswalks are painted white like other traffic markings.

The new law further specifies that the words "SLOW—SCHOOL—XING" must be painted, also in yellow, in traffic lanes leading to school crosswalks.

Most of the repainting of the crosswalks will be done by the Division of Highways, except that on state highways through cities, where maintenance is by agreement performed by the cities, local authorities are being requested to apply the yellow color. The repainting is scheduled for completion this fall.

The division plans to obliterate the existing white markings by sandblasting to prevent a confusing mottled yellow and white effect which would otherwise arise after the new paint has worn a little.

PARALLEL CARQUINEZ BRIDGE

Continued from page 5 . . .

the freeway south of the Hercules junction, just north of Pinole.

In the four miles south of Carquinez Bridge there will be interchanges, with connections to the local crossroads, and nearby towns. Design is now under way on all of these structures.

North of the bridge, the present route through Vallejo will be converted to a full freeway with no intersections at grade. Separation structures are planned for all of the important cross streets and highway intersections.

MEXICO AND MOTOR VEHICLES

Mexico had 438,250 motor vehicles in 1953, reports the National Automobile Club.

California Wins Fifth Consecutive Traffic Award

For the fifth consecutive year, California has been awarded a first prize for outstanding performance in the field of traffic engineering by the Institute of Traffic Engineers. The award was announced by the board of directors of the institute at its meeting in Atlanta on June 10th.

This year, as last, California shares. first place honors with the State of Michigan in the group of states with the most traffic and population.

Two California cities also received awards. Pasadena won first place in the 100,000 to 200,000 population class among cities throughout the Nation; Los Angeles shared a second place award with Detroit in the 1,000,000 and over group, in which first place went to Chicago.

The committee of judges, all members of the Institute of Traffic Engineers, was made up of six nationally known experts in the traffic and transportation fields.

Awards were based on the annual inventory of traffic safety activities conducted by the National Safety Council and other technical and educational organizations.

Harry Porter, Jr., Institute President and Senior Traffic Engineer for the National Safety Council, announced the awards and complimented the states and cities selected for their accomplishments.

Subsequently, on July 28th, Joe E. Havenner of the Auto Club of Southern California and a director of ITE presented a plaque in recognition of California's first place award at a ceremony in the Governor's Office in the State Building, Los Angeles.

Governor Goodwin J. Knight accepted the plaque and in turn presented it to George M. Webb, Traffic Engineer for the California Division of Highways, who represented Director of Public Works Frank B. Durkee and State Highway Engineer G. T. McCoy.

For the past five years, California has competed in a special group of the Nation's most thickly populated, heavily trafficked states which also includes New York, Pennsylvania, Ohio, Indiana, Illinois, Michigan and Texas.

New Assistant State Architect Is Appointed

Earl W. Hampton of the State Division of Architecture has been appointed Assistant State Architect, Administrative, by Anson Boyd, State Architect. Hampton has been acting in this capacity since the retirement of his predecessor, W. K. Daniels, Sr., last January.

Boyd said Hampton will have administrative responsibility for fiscal and budgetary matters pertaining to the Division of Architecture. Broadly, Boyd added, his job will be to administer and manage all construction contracts, supervise divisional cost controls and operating budgets, and administer and maintain cost controls of construction budgets. Most housekeeping activities of the division will come under the control of Hampton's office. Hampton is a native son of Sacramento County.

Civil Engineer's Society Honors Californians

Raymond J. Ivy, a supervising bridge engineer for the State Division of Highways, and Stewart Mitchell, who retired recently as a principal bridge engineer for the division, have been honored by the American Society of Civil Engineers.

They and four other Californians received the society's Arthur M. Wellington prize for 1955 for a technical paper entitled "Live Loading for Long Span Highway Bridges."

The other recipients are C. F. Scheffey and T. Y. Lin of the University of California faculty and N. C. Raab and V. J. Richey of the State Division of San Francisco Bay Toll Crossings.

Templeton Bypass

Removal of Through Traffic Helps Farm Community

By JOHN F. KELLY, Headquarters Right of Way Agent

COMPLETION of a six-mile expressway south of Paso Robles in the summer of 1953 meant another step forward in achieving the goal to multi-lane U. S. Highway 101 from Los Angeles to San Francisco. To the highway motorist, this new expressway meant an additional reduction in travel time and another step in building safe driving into the coast route. As a result of this construction it would no longer be necessary to travel at a reduced speed for a distance of approximately one-half mile to get through the community of Templeton. To the people of Templeton, the new expressway meant the removal of through highway traffic from their town. It also raised the important question which confronts every town when bypassed: How will this change affect the economy of the community?

The Land Economics Section of the California Division of Highways has prepared a number of comprehensive economic studies as a public service to provide communities affected by major highway changes with a factual report on how the economy of the community has been influenced. In keeping with this policy, a factual study has been conducted in an effort to provide an answer to the question of how the economy of Templeton has been affected by the rerouting of highway traffic away from the center of town. This economic study differs from previous studies of communities bypassed in that no evidence could be found to indicate that any portion of Templeton's economy was primarily dependent upon highway traffic.

Type of Community

Templeton is a farm center located halfway between Paso Robles and Atascadero in San Luis Obispo County. The town was created for the purpose of providing a market for the farmers in the surrounding area. The economy of this unincorporated community of 600 people is still based upon the original purpose for which it was founded: to serve the local area.

The location of the town along U. S. Highway 101 near the Southern Pacific railroad was a logical choice for a townsite because it provided good access from farm to market as well as the opportunity to utilize the railroad for shipping farm products. As the economy revolves around serving the local farm area, the role played by the highway should be the assistance that it can give to encourage and sustain farm activities. As through traffic increased, the highway ceased to effectively serve this farm community.

Traffic and Accidents

As the character of highways change from land service roads to arteries carrying large volumes of fast-moving traffic, the policy of the California Division of Highways has been to reroute traffic around many towns by means of an access controlled bypass. Development of this type of highway has improved safety conditions for highway motorists as well as providing a facility capable of serving an anticipated increase in highway travel.

The average daily traffic on U. S. Highway 101 through Templeton prior to construction of the bypass varied from 7,500 to 8,000 vehicles. Traffic studies revealed that a very small percentage of this traffic volume originated or had its destination in Templeton.

A tabulation of the number of accidents occurring on the six-mile section of U. S. Highway 101 extending south from Paso Robles through Templeton shows that there were four times as many accidents during the year before the expressway was opened as compared with the year following its completion. The accident reports also show that during the year before opening the bypass, 25 percent of the total accidents on the old highway

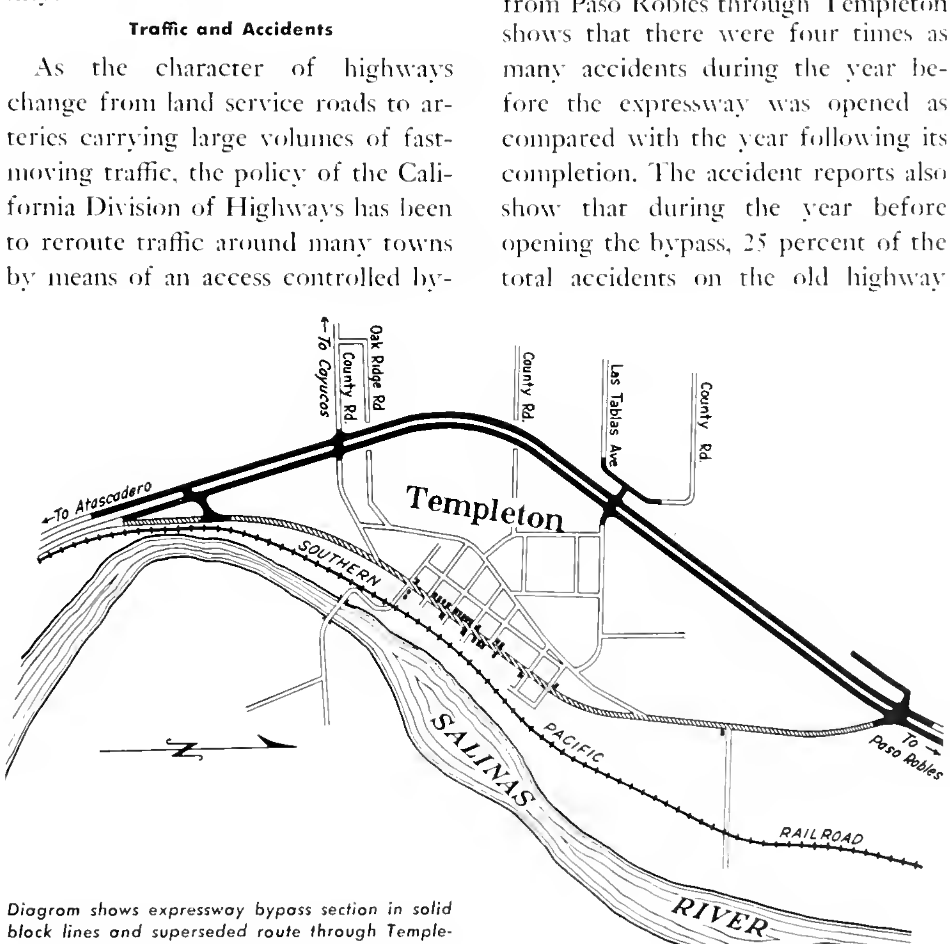


Diagram shows expressway bypass section in solid black lines and superseded route through Templeton by a shaded line. Black squares indicate location of retail outlets bypassed by new expressway.

occurred within the one-half mile portion of the highway routed through Templeton.

During the first full year the new expressway was in use, there were fewer accidents over the entire six-mile length than occurred just in Templeton during the last year that highway traffic was routed throughout the town.

A comparison of the accident rate conclusively shows that safety conditions were greatly improved for the highway motorist as well as the citizens in Templeton by rerouting the highway away from the center of the community.

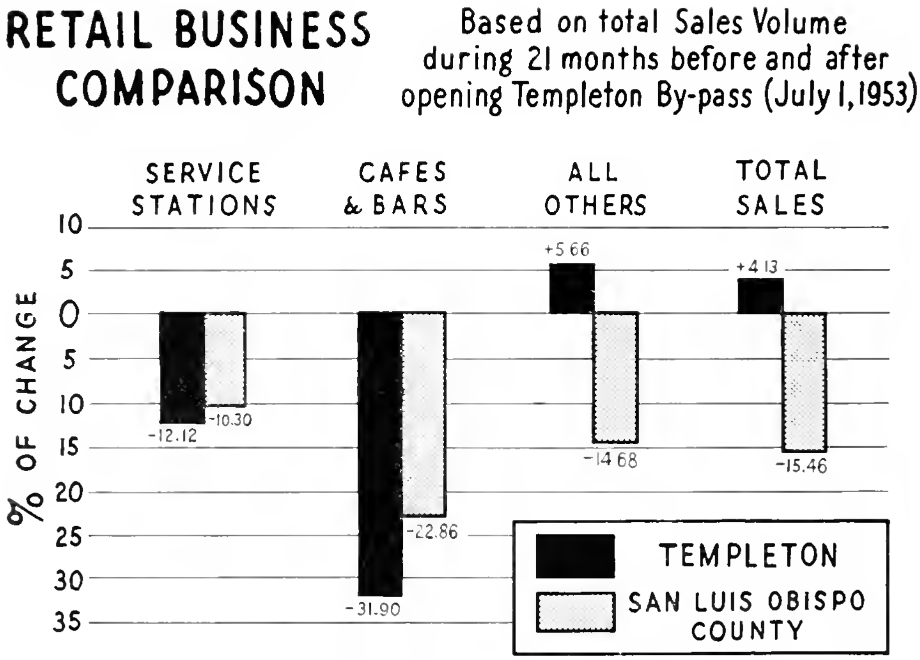
Retail Business

The residents of Templeton and the farmers doing business in town have been using the old highway for nearly two years since the construction of the bypass and have had an opportunity to observe traffic conditions in their community after the removal of the heavy volume of through traffic. It is apparent that the number of accidents have been reduced and congestion no longer exists.

However, the economic effect of the highway bypass on the community is not something that you can see and identify. Perhaps for this reason, it is not unusual to find a wide divergence of opinions on how the economy of the community has been affected. The only means of providing a reasonable conclusion of this effect is to utilize all of the factual data available as the tools for making a sound analysis.

Reliable Indicator

The data relating to retail business was found to be the largest available source of factual information on which to base this study. This source offers a reliable indicator in that the success or failure of retail business in a town such as Templeton generally reflects the economic stability of the entire community. In order to accurately measure the gains or losses made in retail business, we have tabulated the gross sales reported by the retail outlets in Templeton to the State Board of Equalization for the purpose



This graph illustrates the percentage increase or decrease in volume of retail sales in Templeton as compared with San Luis Obispo County during a similar period of time

of paying sales tax. These figures provide an accurate basis for making a comparison of the business gains or losses before and after a specific date. In this case, the date used in the time when through highway traffic was removed from the business district in Templeton.

From a mathematical standpoint, the gains or losses in the volume of gross business before and after this date might represent the degree of influence the highway change has had upon retail business. However, there are economic factors which can influence the mathematical answer and they must be interpreted in order to determine their relative weight in providing a more realistic analysis on the success or failure of retail business. This study, an economic analysis, is not based entirely upon the mathematical answer. It is our aim to consider all factors having an influence upon the general economy of the community.

The first step in analyzing the "before" and "after" gross sales volume is to determine whether the gains or losses of retail business in Templeton follow the trend normally expected during a given period of time. In order to make this analysis we have made a comparison with the gross volume of retail business in San Luis Obispo County.

Scope of Study

The time period covered by this economic study covers a total of 3½ years, which permits a comparison of 21 months before and after the removal of through traffic from Templeton. July 1, 1953, has been used as the date separating the before and after time period because it coincides closely with the date when the bypass went into effect. The gross sales reported by each retail outlet have been tabulated for the study period. As a protection to the individual businesses, this report shows business gains and losses through percentages.

Types of Business

Retail outlets such as service stations, cafes and bars are the type of businesses most frequently patronized by the highway motorist. In order to determine if the removal of through traffic from Templeton has had a direct effect upon those businesses which might derive part of their income from that clientele, the gross sales of service stations, cafes and bars are shown separately from all other retail business. The remainder of retail outlets in the community are grouped together under an "all other" classification. These retail outlets constitute the majority of the business in the community and are dependent upon local patronage for their success.

Business Comparison

A comparison of gross retail sales in Templeton, before and after the bypass, with similar sales throughout San Luis Obispo County are listed in the table below. The percentages in this table are also shown in the accompanying chart to portray the differences in business volume for the various types of business.

	Templeton	*San Luis Obispo County*
Total sales	4.13% gain	15.46% loss
Service stations	12.12% loss	10.30% loss
Cafes and bars	31.90% loss	22.86% loss
All others	5.66% gain	14.68% loss

During the 21-month "before and after" comparison, San Luis Obispo County suffered a retail business decline of 15.46 per cent, whereas Templeton enjoyed an over-all business gain of 4.13 percent after the removal of through traffic from the community. Although state-wide gross retail sales have not been included in the accompanying table and chart, it is interesting to note that during this same comparative period, total retail business in the State increased 6.16 percent. This comparison indicates that San Luis Obispo County was influenced by economic factors not occurring on a state-wide basis. Likewise, the similarity in business activity in Templeton as compared with the State during this particular period of time indicates that Templeton apparently was not subjected to the same economic influence which seemingly affected the remainder of the county, or at least a major portion of it.

Military Influence

Sound judgment and conclusions resulting from an economic study are dependent upon a thorough investigation and an analysis of any factor which is capable of influencing the economic status of the local area. Such a factor was the military influence as a consequence of the three Army camps located in this area; namely, Camp Roberts, at the northerly boundary of the county near Paso Robles; Camp San Luis Obispo, in the central portion of the county near the City of San Luis Obispo; and Camp Cooke, in Santa Barbara County, located a relatively short distance from the beach communities in the southerly portion of San Luis Obispo County.

A special report was requested and prepared by the Sixth Army Headquarters listing the total military and civilian personnel stationed or employed at each of the three Army camps during the time covered by this study. Their report shows a remarkably close relationship between gross business in San Luis Obispo County and fluctuations in personnel strength at the Army installations.

During the 21 months "before" July 1, 1953, the total personnel in these Army camps varied from 28,874 to 53,319. The addition of this buying power to the San Luis Obispo County population of 52,000, indicates almost a 100 percent increase in potential sales.

Army Personnel

The military bases provided a limited number of living quarters. The personnel residing on the base generally do not patronize retail outlets in the "all other" classification. However, this group does patronize the service stations, cafes, and bars. Actually, their purchases follow a pattern similar to the type of merchandise sold to highway motorists. Perhaps the one notable exception to this comparison is the volume of business the local automobile dealers derive from all personnel at the nearby Army camps.

The large number of residential units in San Luis Obispo County occupied by the families of personnel at military installations indicate that the retail outlets dependent upon local business such as clothing, furniture, appliances, etc., also benefited from this "extra" buying power in the county.

On July 1, 1953, the personnel strength at the three Army camps was 32,727. Within the following six months, the total personnel at the three camps was reduced to approximately 1,000 and has remained around that figure for the entire "after" period of this study. It is an unusual coincidence that the drastic change in the military situation took place at the same time the bypass of Templeton was opened. The removal of the military buying power unquestionably was the principal cause for total busi-

View of Templeton business district along old highway route. Note large feed and grain building in left portion of photo.

ness receipts in San Luis Obispo County to decrease by 15.46 percent during the 21 months after July 1, 1953. Although the service stations, cafes and bars throughout the county suffered quite heavy business losses, the greatest loss to the county resulted from the decrease in business receipts of those retail outlets representing the majority of business and having the greatest impact upon the economy.

Considering the influence which the military installations have had upon the economy in San Luis Obispo County, the problem of this economic study is to distinguish between the influence of the military installations and the effect of rerouting through traffic in Templeton. This community did not have the facilities to provide housing for families of the military personnel. As a consequence, the majority of retail outlets in Templeton, which derive their income entirely from local trade, did not enjoy the benefits of the military purchasing power, while it existed in the county. A limited number of retail outlets such as service stations, cafes, and bars were in a positon to increase their income by the influx of military personnel in the area; however, their gains did not have any appreciable effect on the general economy of Templeton. Therefore, the military installations did not become a factor influencing the economy of Templeton, aside from the business gains enjoyed by a small number of retail outlets. Any major change can therefore be considered as a result of the highway bypass.

Service Stations

A comparison of the gains and losses by the different types of businesses as shown on the accompanying chart reveal that service stations were the only type of business where a similarity was shown between Templeton and the county.

Two major factors capable of influencing service station business in Templeton occurred almost simultaneously; the removal of highway traffic and a large number of military personnel from the general vicinity. If the military change was responsible for the 10.30 percent loss to service stations throughout the county, then that portion of the 12.12 percent loss in Templeton in excess of the county, amounting to 1.82 percent, might well be attributed to the removal of highway traffic.

In consideration of those factors which have a bearing on business activity, we cannot overlook merchandizing methods. In the case of service stations, the new modern super station is the type which attracts the highway motorist. Obsolete improvements are a definite liability in obtaining business from the through traveler. There are a number of the new super stations in San Luis Obispo County, but none of this type in Templeton.

Stations which provide good service are going to retain their customers regardless of the age or attractiveness of improvements. This type of clientele consists primarily of local citizens, and the rerouting of highway traffic would have no effect on that type of business.

It is quite possible that the absence of new super service stations in Templeton could have caused the 1.82 percent loss, even if the town had remained on the highway route.

Cafes and Bars

The greatest loss suffered by any one group of businesses in Templeton and San Luis Obispo County were the cafes and bars. The comparison of gross business reveals they suffered a 9.04 percent greater loss in Templeton than in the county. On a statewide basis, there has been a general downward trend in liquor and bar business during the past two years. Considering this fact, local economic factors play only a secondary role as an influence on this type of business because of the change taking place in the general buying habits of the public.

Like service stations, the cafes and bars in Templeton undoubtedly benefited from the personnel at the military installations during the "before" period. Therefore, it is reasonable to assume they participated equally with the county in the general decline of cafe and bar business. However, it follows that the 9.04 percent greater loss suffered by cafes and bars in Templeton was likely the result of other influences.

Management, age and attractiveness of improvements, and rerouting of highway traffic are among the principal factors which may have played a dominant role in contributing to the additional 9.04 percent decline. Exactly how much influence any one factor may have had upon the success of this type of business is difficult to ascertain.

Majority of Business

The "all other" type of business represents the largest number of retail outlets in Templeton. This group consists of such businesses as clothing, hardware, furniture, feed and grain, farm machinery, etc. Their success or failure depends upon the patronage of local customers. The tabulation of business receipts as shown on the accompanying table and chart reveals that after the removal of through traffic this "all other" group of retail business enjoyed a 5.66 percent gain. During the same comparative period of time, the county suffered a 14.68 percent loss among the majority of retail outlets. The difference of 20.34 percent indicates the stability of Templeton and the maintenance of a business growth comparable to the State as a whole. It also indicates a self-sufficiency not too greatly affected by the fluctuation of military personnel in the county.

An unusually large percentage of the total retail outlets in Templeton cater exclusively to the needs of farmers in the area. This type of business does not depend upon the highway motorist or any other outside source of income for its success. On the contrary, the removal of highway congestion makes it easier for these businesses to serve their customers. The highway again regains its position as a land service road and offers to the people a traffic facility that had been destroyed by the introduction of excess traffic.

CONCLUSIONS

In summarizing this economic study, the following conclusions can be made:

1. Templeton, regardless of highway realignment, has kept pace eco-

Employees Receive Twenty-five-year Awards

Employees of the Division of Highways who became eligible for 25-year awards during June and July, 1955, are:

Name	Total service Yrs.	Mos.	Days
ELIGIBLE ON JUNE 30, 1955			
District I			
Gutsch, Vivien A.	25	0	23
District II			
Brunelli, Louis P	25	0	17
District III			
Ellis, Merle W.	25	0	18
Koster, Henry H.	25	0	29
Swartz, Joseph M.	25	0	8
District IV			
Hendrickson, Carl	25	0	8
Marks, Leland A.	25	0	8
District V			
Kalar, Carl A.	25	0	1
District VII			
Driscoll, Albert E.	25	0	23
District VIII			
Dorsey, Myron W.	25	0	6
District X			
Zimbelman, Albert	25	0	29
Central Office			
Cunniff, Andrew J.	25	0	11
Nelson, Berndt.	25	0	25
Bridge Dept.			
Stearns, Raymond E., Jr.	25	0	1

Name	Total service Yrs.	Mos.	Days
ELIGIBLE ON JUNE 30, 1955			
Materials and Research			
Kuhlman, Harry F.	25	0	22
Department of Public Works, Division of Contracts and Rights of Way			
Reed, Robert E.	25	0	6
ELIGIBLE ON JULY 31, 1955			
District II			
Harry, Earl W.	25	0	13
Hislop, A. W. "Joe".	25	0	9
Izzard, Loyal J	25	0	13
District IV			
Kergel, John L.	25	0	2
Weymouth, L. A	25	0	0
Wright, Willard W	25	0	7
District VI			
Locarnini, Inez	25	0	22
Reynolds, Albert M.	25	0	11
District VII			
Axtman, William F.	25	0	1
Shira, Alan R.	25	0	6
District X			
Dillon, Edward J.	25	0	25
Central Office			
Glass, Maynard	25	0	1
Whaley, Thomas E.	25	0	25

nomically with the State in showing a 4.13 percent gain for total retail business.

2. That Templeton's 4.13 percent business gain has been achieved in spite of a county business drop of 15.46 percent.
3. Although the service stations, cafes and bars followed the general trend of the county, their losses did not seriously affect the gains made by all other business. The 4.13 percent gain in total business confirms this fact.
4. In addition to improving local traffic conditions, Templeton should benefit in the future by its proximity to the new expressway.

OREGON'S HIGHWAY SYSTEM

Oregon's highway system, according to the National Automobile Club, currently contains over 55,000 miles of roads, including forest, state, and county roads.

DON'T LOSE YOUR TEMPER

If you lose your temper while driving you may very well lose your life.

In Memoriam

ROBERT C. McFARLAND

Robert C. McFarland, construction superintendent with the Division of Highways for 25 years, succumbed in San Jose on June 15th. Mr. McFarland retired 2½ years ago.

Mr. McFarland first came to work for the State in 1928 as resident engineer at Ingot, District II, Redding. Subsequently he served as superintendent of an honor camp in Kings Canyon-Fresno, District VI, completing a highway into Cedar Flat. In 1943 he became superintendent of Honor Camp 36 at Burnt Ranch, Eureka District I.

Mr. McFarland was born in Grafton, Massachusetts, and came to California early in the century. He was educated in the Bay area and studied at Van der Naillen College of Engineering, San Francisco.

He is survived by his widow, Gretchen Powell-McFarland, and two daughters, Gladys Rathie of Oakland and Florence Bunker of Coalinga.

Helen P. Klauser Completes Quarter Century Service

Twenty-five years, all but a year and a half with the Department of Public Works, make up the service record of Mrs. Helen P. Klauser, Secretary and Administrative Assistant to Frank B. Durkee, Director of Public Works. She recently was awarded her 25 years' service pin.

HELEN P. KLAUSER

Mrs. Klauser started her career as a junior stenographer in the District II office of the Division of Highways in Redding. She has worked in the Highway Personnel Office, San Francisco-Oakland Bay Bridge Office, California Commission for the Golden Gate International Exposition, and in the office of the State Highway Engineer.

The late Charles H. Purcell, Chief Engineer of the San Francisco-Oakland Bay Bridge, asked her to serve as his secretary in March of 1936. She was Mr. Purcell's secretary for 12 years, eight of which were while he was Director of Public Works.

She has seen the director's office grow from a staff of six to its present force of 20 employees. The duties and responsibilities of Mrs. Klauser's job are varied and numerous. Her knowledge of the functions of each of the divisions of the department, her loyalty, and her keen interest in her job have made her a credit to the Department of Public Works.

DON'T DRIVE WHILE DROWSY

Drowsing in a chair by an open fire can be pleasant pastime. Drowsing at the wheel of a moving car can be a fatal mistake. Don't drive while drowsy.

GRADE CROSSINGS

As of June 30, 1954, there were 849 railroad grade crossings on California state highways. During the preceding year 25 grade crossings were eliminated by construction of underpasses and overheads.

ADDITIONAL FOUR LANES ON U.S. 40 IN SIGHT

At its August meeting the California Highway Commission will consider the adoption of a freeway routing for an 11-mile section of U. S. Highway 40 from one mile northeast of Roseville to one mile east of Newcastle, Placer County.

Adoption of such a routing would be a step toward the further four-laning of US 40 east of Sacramento.

State Highway Engineer G. T. McCoy has recommended a route which would run from a half to three-quarters of a mile south of the present highway.

A public meeting was held in Auburn on July 13th at which information was presented on various possible routes. Subsequently the board of supervisors of Placer County adopted a resolution stating that further hearings on the proposed route were not necessary.

The recommended route would leave the present highway just east of the end of the Roseville Freeway now under construction between Ben Ali and one-half mile east of Roseville. It would follow along Secret Ravine, skirting Rocklin and Loomis to the south. Near the end of Secret Ravine it would turn northerly to bypass Newcastle on the east and connect with the existing highway approximately one mile east of Newcastle.

Plans of the Division of Highways call for construction of a four-lane full freeway on this section of US 40, with provision for ultimate development to six lanes. At each important public road a grade separation would be provided so that the present county road system would not be disrupted.

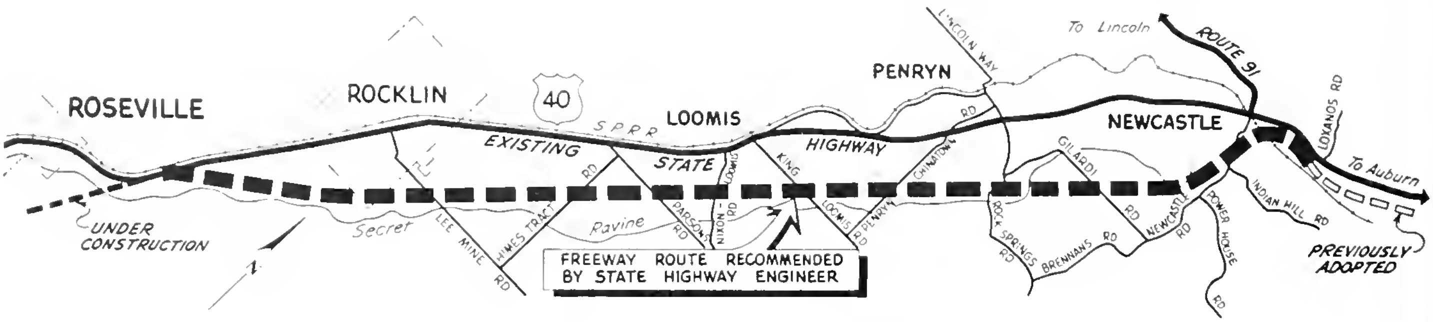
The present highway would continue to serve local traffic and would be connected with the freeway by appropriate interchanges.

State highway engineers estimate that to construct a freeway on the recommended route would cost approximately $5,500,000, including rights of way. Start of construction would depend on the availability of future state highway funds.

The 1955-56 state highway budget contains an allocation of $900,000 to build structures for 2.7 miles of freeway between one mile east of Newcastle and Elm Street in Auburn.

US 40 has been constructed as a multilane expressway for 8.1 miles between Auburn and Applegate, and construction is under way on 2.7 miles from Applegate to Heather Glen under a $671,410 contract.

Adoption of a routing between east of Roseville and east of Newcastle would close the one remaining gap in the freeway routing of US 40 between Sacramento and one mile east of Magra, near Gold Run. This is a total length of approximately 54 miles.



New Directory of ARBA Is Off Press

The 1955 edition of American Road Builders' Association's convenient pocket-sized directory of "Highway Officials and Engineers" is available for distribution.

This edition contains:

1. More than 1,500 names, titles and addresses of administrative engineers and officials in the 48 state highway departments and the District of Columbia.
2. Administrative personnel of the Bureau of Public Roads, including the heads of its division offices.
3. Engineers and administrative personnel of toll road authorities.
4. Officers and directors of ARBA, its seven organized divisions, and its Washington headquarters staff.
5. A tabulation by states showing highway funds expended during 1954, as well as an estimate of expenditures for highway construction and maintenance during 1955.
6. A tabulation of states having legislative authority to construct toll roads.

VEHICLES ENTERING CALIFORNIA

A total of 405,720 motor vehicles entered California during June of this year as compared with the 378,607 that entered during June, 1954, reports the National Automobile Club. Of the June, 1955, total, 376,689 were passenger cars, 24,803 were commercial trucks, and 4,228 were stages.

INJURED IN TRAFFIC ACCIDENTS

More than 678,000 persons were injured in week-end traffic accidents in the United States during 1954, reports the National Automobile Club.

FREEWAY ROUTING THROUGH MORAGA VALLEY IS PROPOSED

The California Highway Commission will consider at its August meeting the adoption of a freeway routing for a section of State Highway Route 233 through the Moraga Valley in Contra Costa County from Bollinger Canyon Road just north of St. Mary's College to State Sign Route 24 near Lafayette.

State Highway Route 233 was added to the State Highway System by the Legislature in 1953 and is described partly as being from Mountain Boulevard near the intersection of Park Boulevard in Oakland to State Sign Route 24 near Lafayette. No traversable route is maintained by the State at present, and future development will be entirely on new location, including the section now under consideration.

For the portion between Bollinger Canyon Road and Sign Route 24, State Highway Engineer G. T. McCoy has recommended what is known as the Reliez Road location. It runs just northerly of St. Mary's College through the Burton area and along Reliez Road to a connection with Sign Route 24 at the Pleasant Hill Road intersection. It would be a little less than four miles in length.

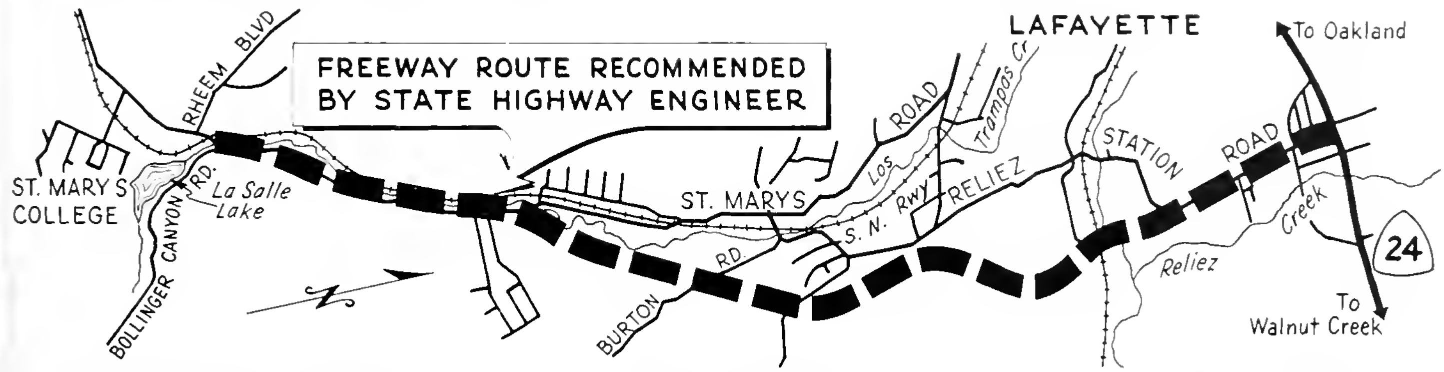
A public meeting was held in Lafayette June 15th to acquaint interested individuals with proposed location studies. On July 8th the Board of Supervisors of Contra Costa County adopted a resolution approving the recommended location and stating that a public hearing by the California Highway Commission would not be necessary.

Plans of the Division of Highways call for construction of a four-lane freeway over this section with provision for an ultimate six lanes. Start of construction would depend on the availability of future state highway funds.

McCoy told the commission that although construction might be some time in the future, adoption of a route at this time would enable the State to determine its needs for right of way before further development takes place, particularly in the Burton area and would also assist in community planning.

A freeway routing for one other section of State Highway Route 233 was adopted by the commission in September, 1954. It extends from Mountain Boulevard in Alameda County to Eastwood Court near the Contra Costa county line. In general, it follows along Park Boulevard in Shepherd Canyon.

When constructed, the proposed highway will serve as an additional connection between Oakland and the rapidly growing central Contra Costa County area as well as an important connection to the north, south, and east.



LIKES ROADSIDE PLANTING

SAN FRANCISCO 11, CALIFORNIA

California Highway Commission, Sacramento, California

GENTLEMEN: On my vacation this summer, I drove down Highway 99, and the oleanders planted in the center of that highway, blooming and waving in the breeze were a joy.

I am sure they must give similar pleasure to other California residents as well as to our visitors, and I am writing this note so you will know that many of us appreciate the beautification of our highways.

Sincerely,

LORRAINE BOYD

LIKES MAGAZINE

CITY OF FRESNO
PLANNING COMMISSION

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: *California Highways and Public Works* is an excellent publication on highway planning and construction in our State. As a planner, I am keenly interested in highway development. The technical matters and data presented in your publication are of extreme importance to me.

Very truly yours,

E. BORIS STAHM
Director of Planning
City of Fresno

LETTER FROM TORONTO

ONTARIO
DEPARTMENT OF HIGHWAYS

KENNETH C. ADAMS, *Editor*

DEAR SIR: I have been on your mailing list for many years. I feel that I have been remiss in not writing to you before, expressing my thanks.

Your articles are well prepared and the publication is issued in excellent form. The technical information made available is most valuable and interesting.

Yours very truly,

C. A. ROBBINS
Services Manager

"Automation"

Machine Computations Save Engineering Time

By SAM OSOFSKY, Supervising Highway Statistician, and R. K. BREECE, Assistant Engineer of Design

One of the most persistent bottlenecks which has challenged the California Division of Highways in its effort to produce the engineering plans for an expanded highway construction program is the routine, time-consuming chore of computing traverses and making other engineering calculations. The time required to make and check these calculations manually is not only costly in dollars and cents, it also represents a considerable drain on skilled engineering manpower which ideally might be devoted to more productive tasks.

For the past 19 years the Division of Highways has utilized electronic computing machines for tabulation and solution of many problems. The machines have been employed in the analysis of origin and destination surveys, of construction and maintenance costs, traffic accident reports, personnel statistics, road life studies, road inventories, status of highways and for many other tasks.

Aware of the rapid development and extended use of electronic computers and automatic calculating processes in scientific, industrial and business fields, the division has been seeking methods to short-cut the expensive drudgery of manual calculations.

In January, 1955, the writers were assigned the task of finding which, if any, calculations made by engineers in the 11 district offices of the Division of Highways could be adapted to machine computation. There is little doubt that complete automation would be possible for many problems on the complex and expensive electronic computing machines now available. The immediate target, however, was an approach to automation through the use of equipment already available in the tabulating section of the California Highway Planning Survey.

The key to the problem was found in a procedure developed by the International Business Machines Corporation for obtaining the sine and cosine of a bearing accurate to seven decimal places, making traverse computations possible.

As a result, the Division of Highways is now solving by machine calculation eight types of traverses, covering the great majority of traverse work encountered in division operations. These eight problem types now being processed are as follows:

1. Traverse computation where all sides and bearings are known. This may be used for original computations in coordinating a traverse or as a check of original computations.
2. Traverse computation where the lengths of two sides are unknown.
3. Traverse computation where the length of one side and the bearing of another side are unknown.
4. The problem described as Type 1 where, in addition, the area within the closed traverse is desired.
5. The problem described as Type 2 where, in addition, the area within the closed traverse is desired.
6. Traverse computation where the length of one side and the bearing of that same side are unknown.
7. The problem described as Type 3 where, in addition, the area within the closed traverse is desired.
8. The problem described as Type 6 where, in addition, the area within the closed traverse is desired.

The process developed depends on a modified IBM Electronic Calculator, Type 604. However, the following six other types of conventional equipment are also required in the process:

- Type 024—Key Punches
- Type 056—Verifiers
- Type 077—Collators
- Type 082—Sorters
- Type 402—Tabulators
- Type 513—Reproducing Punches

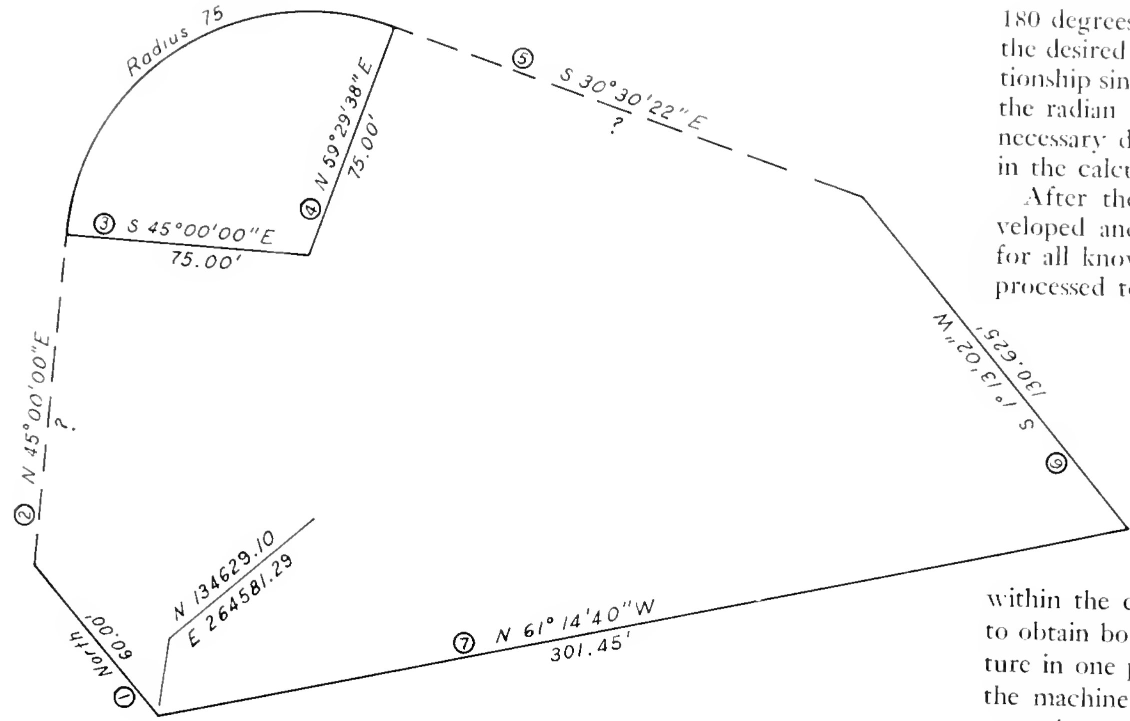
To process all eight problem types, 61 separate steps are taken using the above equipment, and 13 different wiring panels are utilized in the Type 604 Calculator. Some of these panels accomplish more than one function, requiring an additional pass of the cards through the machines, due to the limitation of the machine in some cases or the limitation of the capacity of the IBM card in others.

Since almost all traverse calculations are done in the various district offices, this procedure was made available to certain districts on a trial basis and has now been extended to all districts.

To make use of this service, the engineer in the district office, when confronted with a traverse such as the typical example shown in *Figure I*, fills out a portion of a traverse sheet with the necessary data, as shown in *Figure II*. However, instead of making the usual routine computations, he goes on to more productive work. These traverse sheets are gathered up and mailed to headquarters daily, making use of air mail where this will materially shorten the time in transit.

When the traverse sheets reach the tabulating section, the data are first punched on cards, one course to a card. The cards are verified by a second punching operation and are then ready for the calculator.

The bearings are reduced to radians the sine and cosine computed by the formulas:



$$\text{Sine } X = X - \frac{X^3}{3!} + \frac{X^5}{5!} - \frac{X^7}{7!} + \cdots$$

$$\text{Cosine } X = 1 - \frac{X^2}{2!} + \frac{X^4}{4!} - \frac{X^6}{6!} + \cdots$$

and the results punched on the cards in one pass of the cards through the calculator.

Mechanically this was facilitated by a factoring process and the application of the formula in the reverse direction. The following is a portion of the factored formula used for the sine:

$$\text{Sine } X = X \left[C_1 + X^2 \left(C_3 + X^2 (C_5 + X^2 [C_7 + C_9 X^2]) \right) + \cdots \right]$$

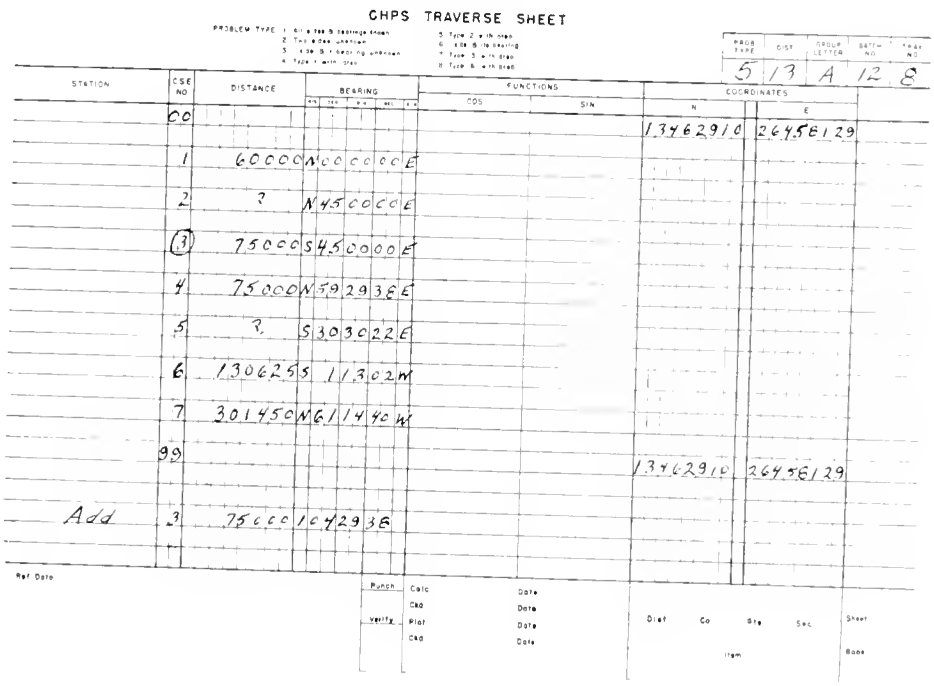
This type of factoring lends itself to repetitive instructions to the Type 604 Calculator and makes it possible for both the sine and cosine to be produced in one pass of the cards. The repetitive instructions slow the normal speed of the calculator from 100 cards a minute to approximately 25 cards a minute. The calculator being used has available 60 programs or instruction steps, approximately 30 of which are repeated 15 times to get the sine and again to get the cosine. John A. Haller, of the research section of the California Highway Planning Survey, who did most of the program planning for the traverse computations, developed a procedure which combined the boards producing the sine and cosine with the boards to convert degrees, minutes, and seconds to radians. In this revision of the original IBM procedure, he also provided for the functions of angles up to 180 degrees and, in order to maintain the desired accuracy, utilized the relationship sin $X = \cos(90 - X)$ to keep the radian value under one. This was necessary due to the limited capacity in the calculator.

After the sine and cosine are developed and punched onto the cards for all known bearings, the cards are processed to obtain latitudes and departures for all courses where both the distance and bearing are known. It was found that it was within the capacity of the calculator to obtain both the latitude and departure in one pass of the cards through the machine at a speed of 100 cards per minute.

For problem Type 1 (traverse computation where all sides and bearings are known), no further processing is required except that the cards be placed in proper sequence by use of the sorter and then printed at the rate of about 40 lines per minute in the tabulating machine.

←Figure I—A typical traverse with the length of two sides unknown. The tabulated solution is shown in Fig. III.

Figure II—Sample traverse sheet for the traverse shown in Fig. I as submitted by the engineer in the district office



CHPS TRAVERSE SHEET

PROB TYPE	DIST	GROUP LETTER	BATCH NO	TRAV NO
5	13	A	12	8

STATION	CSE NO	DISTANCE	BEARING	FUNCTIONS COS	FUNCTIONS SIN	COORDINATES N	COORDINATES E
	00					13462910	26458129
	1	60000	N000000E				
	2	?	N450000E				
	3	75000	S450000E				
	4	75000	N592938E				
	5	?	S303022E				
	6	130625	S11302W				
	7	301450	N611440W				
	99					13462910	26458129
Add	3	75000	1042938E				

Ref Date
Punch Verify Calc Ckd Plot Ckd Date Date Date Date Dist Co Rte Sec Item Sheet Book

A sample of the tabulation which is returned to the originator of the traverse is shown in *Figure III*.

Where the lengths of two unknown sides are involved (Problem Type 2), the following formula is solved by additional processing in the various machines:

$$X = \frac{\Sigma D \cos Y - \Sigma L \sin Y}{\sin X \cos Y - \cos X \sin Y}$$

In the Type 3 problem where the length of one side and the bearing of another side are unknown, the following formula is solved:

$$Y = \Sigma D \sin Y + \Sigma L \cos Y \pm \sqrt{(\Sigma D \sin Y + \Sigma L \cos Y)^2 - (\Sigma L)^2 - (\Sigma D)^2 + X^2}$$

This results in two solutions, both of which may close the traverse. The two solutions are listed as two consecutive traverses and returned to the engineer, who, by inspection, can easily select the rational solution.

The unknown bearings in problem Types 3 and 6 are solved by the use of the arc sine series:

$$\sin^{-1} X = X + \frac{1}{2}\cdot\frac{X^3}{3} + \frac{1}{2}\cdot\frac{3}{4}\cdot\frac{X^5}{5} + \frac{1}{2}\cdot\frac{3}{4}\cdot\frac{5}{6}\cdot\frac{X^7}{7} + \cdots$$

It is interesting to note that wherever possible each unknown is calculated separately instead of using a forced closure procedure. This provides an additional check of the work.

To illustrate the use of some of the auxiliary equipment a general procedure used for problem Type 4 (all sides and bearings known, but area desired) is indicated as follows:

At the completion of the second pass of the cards through the calculator which developed latitudes and departures, the cards are brought to the sorter to extract cards for circular segments. The remaining cards are sorted additionally on columns identifying the problem types, district, group, batch, traverse number, and course number.

Problem Type 4 is then extracted and processed through the collator, at which point a blank card is inserted behind each traverse. The area of the traverse is later summarized on this card. All pairs of radii are extracted

Problem Type	District	Group	Batch	Traverse	Course	Area in Square Feet		Cosin…
						Distance	Bearing	
5	13	A	12	8				
					1	60000	N000000E	1000…
					2	101780	N450000E	707…
					3	75000	S450000E	707…
					4	75000	N592938E	507…
					5	152540	S303022E	861…
					6	130625	S011302W	999…
					7	301450	N611440W	481…
					99			
						Traverse area	44907	
					3	Segment area	2406	
						Net area	47313	(Sq. F…

Calculated unknowns

Figure III—Traver…

AVERSE COMPUTATIONS

* South or West

	Sine		Area in Acres / Latitude / Error of Closure		Departure	Coordinates North Progressive	Coordinates East Totals	Seq Ck.
						134629 10	264581 29	
0			60 00					
						134689 10	264581 29	
8	7071068		71 97		71 97			*
						134761 07	264653 26	
8	7071068	*	53 03		53 03			
						134708 04	264706 29	
3	8615750		38 07		64 62			
						134746 11	264770 91	
0	5076303	*	131 42		77 43			*
						134614 69	264848 34	
3	0212429	*	130 60	*	2 77			
						134484 09	264845 57	
8	8766801		145 02	*	264 28			
						134629 11	264581 29	
					Error of closure			*
						1 *		
			01	*		1	999999 99	
			1 031			Error of closure to end coordinates		
			055		96817 43			
						Sine of delta		
			1 086 (Acres)					

...ns. Tabulation resulting from processing the traverse sheet shown in Fig. 11.

and each pair replaced by a card containing the sums of the latitudes and departures of the pair. The area within the traverse is then computed by use of double meridian distance and recorded on the blank card. Cards for circular segments are processed separately through the calculator to obtain the area of the circular segments utilizing the following formula:

$$\text{Area} = \frac{R^2}{2} (\text{Delta in radians} - \text{sine delta})$$

At the completion of the two phases the cards are again processed through the collator to replace the radius pairs and insert the area segment cards in their proper places. Cards are now ready to be processed through the Type 402 Tabulator which provides the listing shown in *Figure III.*

Solving for unknowns in a traverse requires the use of the tabulator and Type 513 Reproducing Punch which summarize the data to be used in the above indicated formulas. Calculation of these formulas requires several passes, due to the limited capacity of the calculator.

In order to hold some of the results of the calculation, the Type 077 Collator is used to insert blank cards behind the summary cards which are obtained in the reproducing punch in conjunction with the tabulator. Subsequently both the collator and the reproducing punch are again used to first match and then reproduce the calculated data onto the original card forms.

After all the calculations have been completed and the traverses have been listed they are separated by district and mailed. As a general rule, the traverses are processed and mailed out the same day they are received.

In general, no inspection or check of the finished tabulation is made before mailing. The users of this service have found that a detailed check of the computations is not necessary. A check of the traverse sheet before submitting it for computation, together with an inspection of the error of closure, end coordinates, and closure to end coordinates on the completed tabulation will in general show up any significant error.

Operators at work at the Type 604 Calculator

The whole procedure calls for a somewhat different approach to the problem of traverse calculations on the part of the engineer who is used to solving one traverse before going on to the next. To obtain maximum benefits from the new service, he must plan his work so that he writes as many independent traverses as possible for one portion of the work and then goes on to other sections of the job while the computations are being done for him. The change from the usual procedure may be difficult for the engineer to get used to at first, but the saving in time and money makes it well worth while.

From a tabulating standpoint the volume of cards handled in these problems is small. However, since calculations are repetitive in nature it is possible to prepare boards which are kept wired permanently for the various steps of each problem type.

Estimates of cost have been made, based on the small volumes handled to date. It has been determined that in addition to relieving engineering personnel for more productive types of work an actual saving in dollars and cents is achieved. The cost of traverse calculations as performed manually has been estimated at 13 cents a course, exclusive of checking; when processed through the presently available IBM equipment the cost is approximately 5 cents a course.

The machine calculation cost includes a pro rata charge for machine time on presently installed equipment in headquarters. As the rental cost for only one of each of the different types of machines necessary for punching and processing the traverse data would be $1,500 per month, it is planned to perform the work in Sacramento. As long as rapid service is provided to the various districts, the existing arrangement is considered the most practical under the present work load and even under a considerably increased work load.

With the development of these traverse calculations completed, the authors are turning their attention to the problem of earthwork calculations, traverse adjustments, and other types of routine engineering calculations, which we hope will bear equally fruitful results.

Precast Curbs

An Experimental Project On US 40 in Placer County

By BLAIR GEDDES, District Traffic Engineer

Precast white reflective curbing was installed recently at several locations on US 40, in Placer County, between Auburn and Applegate.

This latest endeavor of the California Division of Highways to improve the visibility of roadway delineation is one of a series of such continuing efforts throughout the State.

The usual curb delineation on California state highways has consisted of a rolled asphalt plant mix curb painted white or recessed concrete curbs with the recesses painted white. Research in this field to improve visibility and reduce curb construction and maintenance costs has included experimental installation of nonbarrier curbs with transverse striations secured through special finishing procedure.

The work reported in this paper is a California test of a curb-type which has been used by the State of New Jersey for several years.

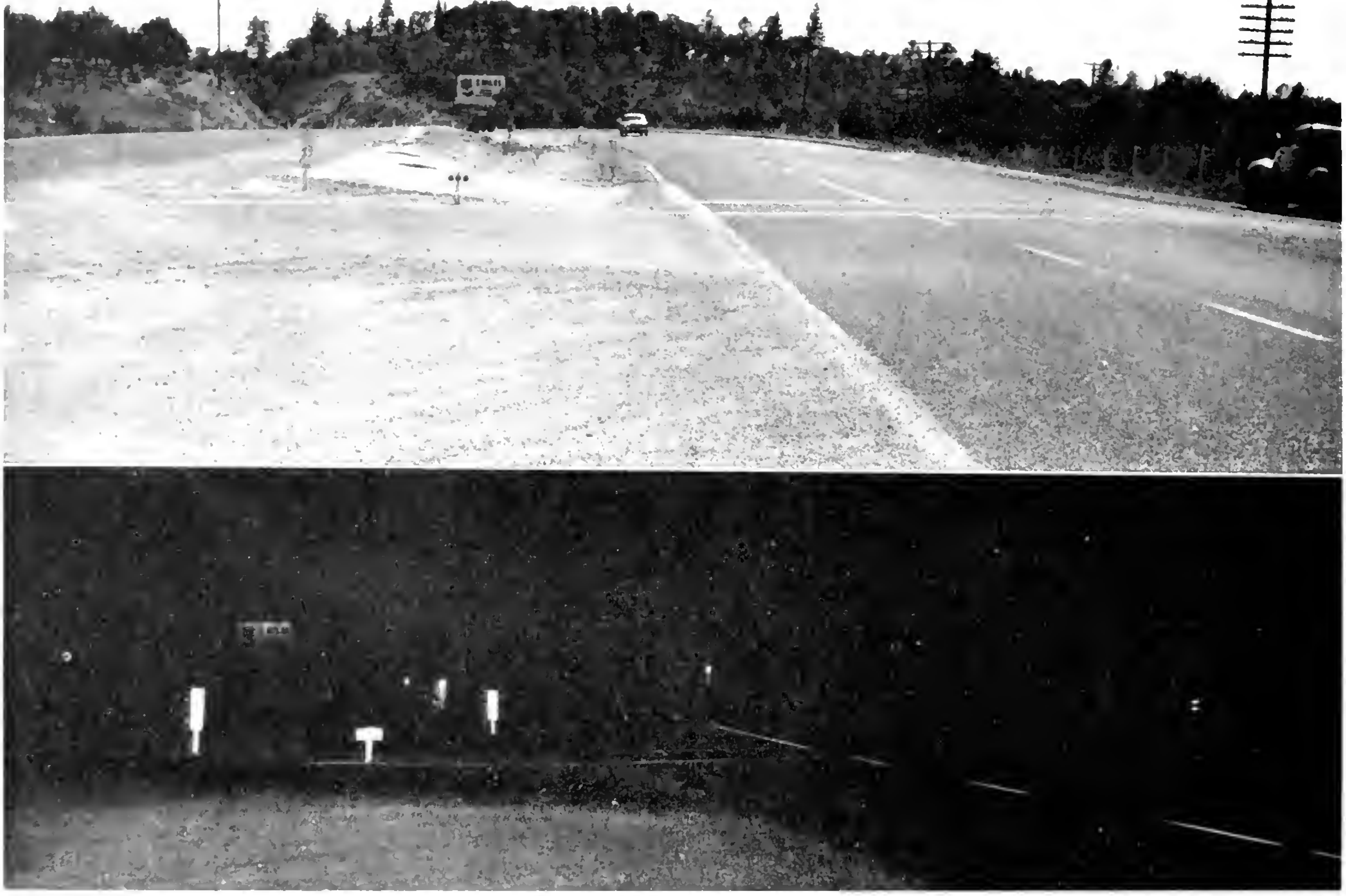
The installation was divided into two distinct parts. The first part involved 1,422 lineal feet of double-faced divider curb placed on top of existing surfacing along the center line of a narrow paved median area. The second part consisted of 1,407 lineal feet of a single-faced curb, similar in cross-section to the California Standard D3 curb which was placed partly on existing surfacing and partly on prepared concrete base in nine separate curb noses at crossovers in the median area of the divided expressway.

US 40 in this particular area is a 4-lane, divided highway with a median varying from an 8-foot paved area to an unpaved width of 36 feet between inner edges of pavement. Although it traverses fairly rough terrain between the 1,500 and 2,000-foot elevations, the grades of the two roadways are practically the same and the median area is depressed, in the unpaved portions, only sufficient for drainage purposes.

UPPER—Spreading mortar for curb section. LOWER—Leveling device for truing up curb.

The majority of the intersecting roads are at acute angles to follow contour lines of the various slopes, with resulting large intersection areas. Local practice developed into cutting across the median area rather than to proceed into the crossover proper. Where such movements appeared numerous, curb noses were planned to delineate the crossover area and discourage the improper movements.

The precast sections were manufactured at the South San Francisco plant of the vendor, the P. Grassi-American Terrazo Company, and were cast in concrete moulds on high frequency vibrating tables. A mix of white Calaveras cement and aggregate consisting of crushed Sonora white marble from



UPPER—Typical curb nose (day) before improvement. LOWER—Same location before improvement (night).

the vendor's quarry at Sonora, California, with a slump of less than 1 inch was vibrated into the forms. Preliminary curing was accomplished in a steam room and final curing in a storage yard under water spray. The extreme care in making the forms was reflected in the smooth surface of the finished product. After final curing, the curb faces were given an application of silicone sealer to completely seal against penetration of dirt and stain. The contract work of installation was also performed by the vendor.

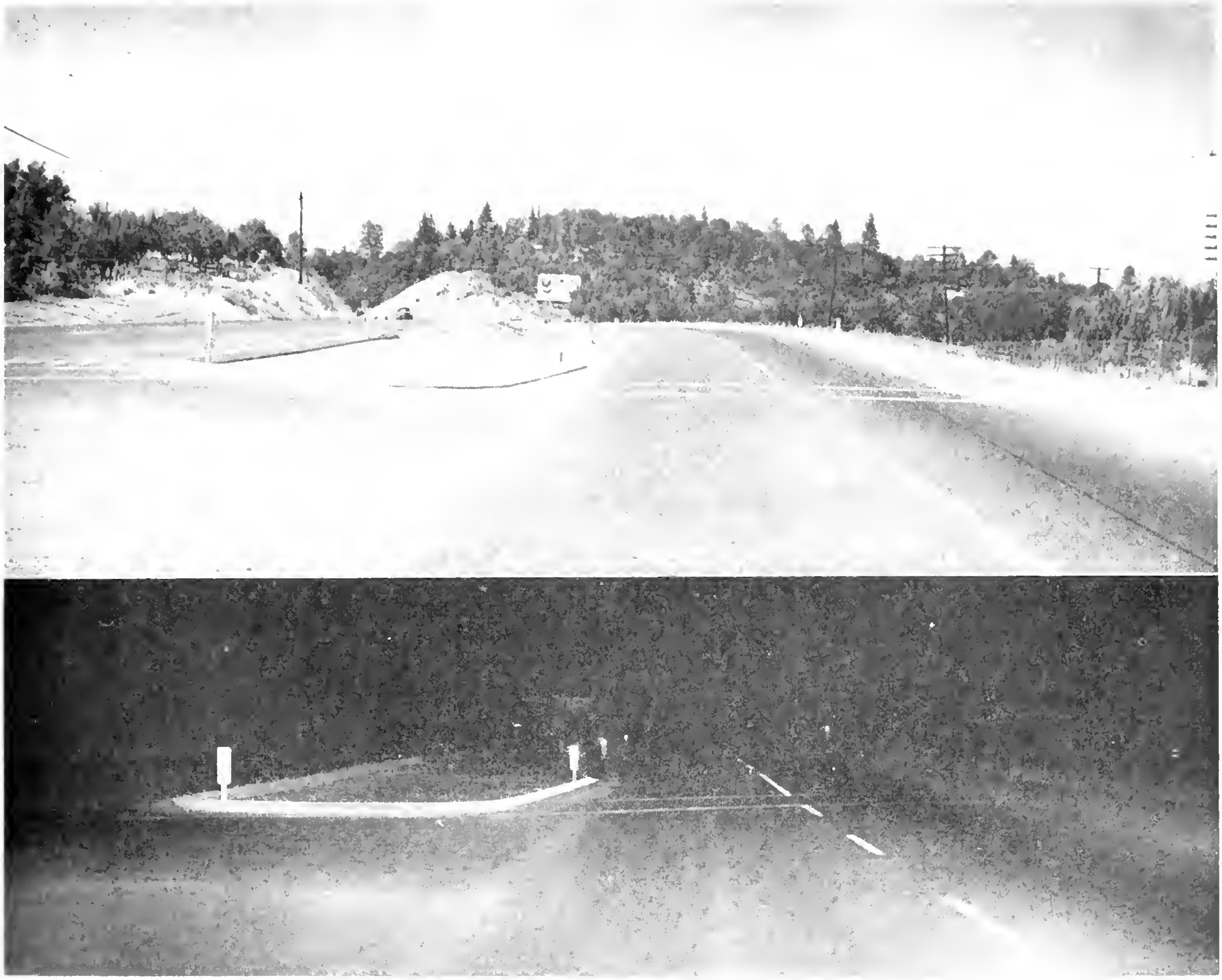
Areas Prepared

The first order of work was to prepare the areas where the curb noses were to be placed. As parts of the areas had some surfacing in place, a careful inspection was made of each location. Where existing surfacing was not completely interlocked and where the curb was to be partly or wholly over unsurfaced areas, a concrete foundation 3 inches x 11 inches was poured to line and grade staked to provide a smooth mortar bed and as near to the elevation of the adjacent pavement as possible consistent with the irregularities of the pavement edge. After these bases were poured, the delivery of the precast sections was commenced.

The installing was commenced with the double-faced divider sections over existing pavement. The precast sections, each 5 feet 4$\frac{3}{8}$ inches in length, were unloaded from the transport truck with a fork lift and placed adjacent to their final position. Concrete nails or short pieces of reinforcing steel, dependent upon the firmness of the underlying surfacing, were driven along the area over which the keyway in the bottom of the section would fit. Mortar, consisting one part Portland cement, three parts sand and 8 percent mortar cream, was spread between two 1 inch x 3 inches boards used as temporary side forms, and within the keyway of the casting. The casting was then lifted by two men using a special tong set and placed in position. A rubber mallet was used to promote subsidence and minor displacement of the mortar to bring the section to the proper grade.

Transverse Slope

Throughout the major portion of the section of paved median where the divider was placed, there was a difference in elevation between the



UPPER—Day view of curb nose after installation. LOWER—Night photograph of same project.

adjacent roadways of from 0.2 foot to 0.4 foot which created a transverse slope across the median. To eliminate ponding of water on the high side during storms, a 4-inch opening was left every 50 feet to provide cross drainage. The resulting gaps are hardly noticeable at normal driving speeds on the adjacent roadway.

By the time that the divider section was completed, the curb bases at the various nose locations were cured sufficiently to begin installation of the curb sections. Seven of the noses were of an 8.5-foot inside radius, six subtending a central angle of 170 degrees 28 feet and the seventh 176 degrees 11. The two remaining noses were 1 foot inside radius for an arc of 165 degrees. The 8.5 radius sections were cast in arcs of 45 degrees each with the fourth section of each nose subtending the required remaining arc. The 1-foot radius sections were cast to the full required 165 degrees. The balance of each installation was completed with the standard 5-foot $4\frac{3}{8}$-inch straight sections. The length of these sections was controlled by over-all span of $10\frac{5}{8}$ inches for each set of reflecting vanes and the lengths of sections were set up in multiples of the vane sets to attain continuity of design. In installing, the curved portion was first placed and then the balance of each side of the nose was completed.

The curb section weighs approximately 53 pounds per foot or about 282 pounds per 5-foot $4\frac{3}{8}$-inch section. This, with the weight of the lifting tongs, amounted to about 160-pound lift per man in setting the sections into place.

Production Decelerated

While the handles were at a height to utilize the best lifting positions, it was noticeable that production decelerated during the latter half of each shift. It appears that a reduction in length would accomplish two objectives; first, a lighter lift per section would probably allow a more uniform rate throughout the day and result in increased footage per shift, and sec-

ond, where grades must be varied to match existing surfacing a better match could be made. Where provisions are included in original planning, much effort to achieve a smooth grade line to match the pavement grade will be eliminated.

The finished job is pleasing in appearance and presents a startling contrast with the existing pavement. The contrast is more noticeable at night than in the day time, and while observations under rain have not yet been made, the visibility factor during final cleanup when the curb was wet from washing indicates that the most pronounced effect will be in stormy weather when headlights under ordinary circumstances are the most ineffective.

Rapid Installation

While the increased visibility factor is one which should improve safety, the cost of installation must be weighed against the benefits derived. On wholly new construction where form protection is minor, the competition with other types and methods will require careful consideration. There is a field, however, where the present method is without comparison and that is in areas where curbs must be superimposed on existing surfacing under traffic conditions. The rapidity with which an installation can be made will subject the traffic on the road to a minimum of inconvenience during the construction period and will have the completed installation in service almost before forms could be set for cast-in-place curbs.

UPPER LEFT—Unloading curb sections. UPPER RIGHT—Driving anchor steel for center divider. LOWER—Setting section of center divider.

Due to the limited footage involved, the actual costs of the work performed do not provide a sufficient basis for estimating costs of future work. Valuable experience was gained on this project. Decision as to further installations of this type will be deferred pending an observation period to ascertain the degree of traffic safety benefit.

Cost Index

Expected Rise in Construction Costs Begins During Second Quarter 1955

By RICHARD H. WILSON, Assistant State Highway Engineer;
H. C. McCARTY, Office Engineer;
JOHN D. GALLAGHER, Assistant Office Engineer

STATE highway construction costs which have been relatively stationary since the fourth quarter of 1951 broke during the second quarter of 1955 when such costs, as reflected by the California Highway Construction Cost Index, jumped 12.2 percent above the Index for the first quarter of 1955. The Index for the first quarter of the year stood at 189.3 (1940 = 100); during the second quarter it rose 23.1 index points to 212.4.

During the past three years highway construction costs have undergone only minor ups and down, even in the face of rises in material costs and continued increases in wage rates and fringe benefits to labor. Competition among contractors has been keen during the last few years and it has been felt that this has been the chief

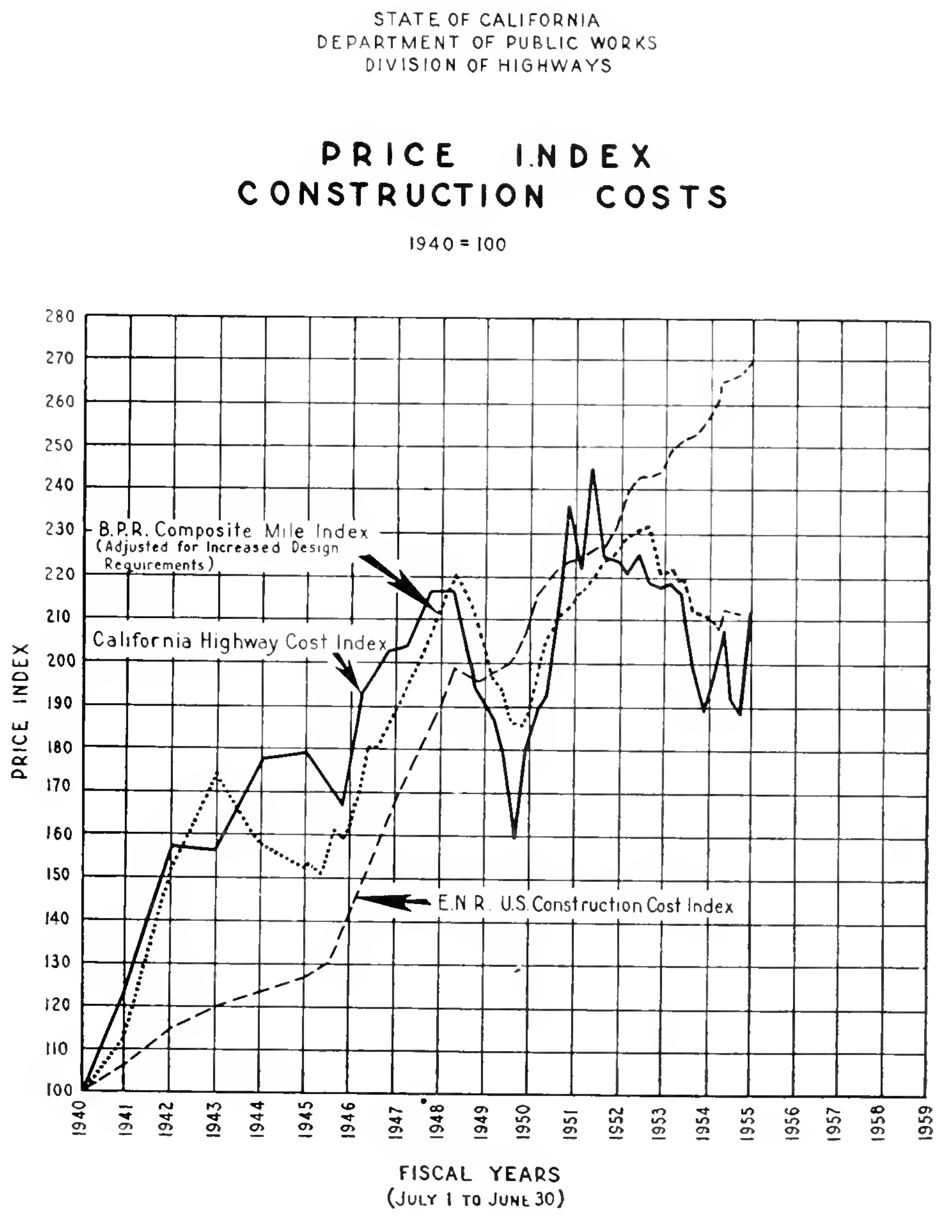
THE CALIFORNIA HIGHWAY CONSTRUCTION COST INDEX

Year	Cost Index
1940	100.0
1941	125.0
1942	157.5
1943	156.4
1944	177.8
1945	179.5
1946	179.7
1947	203.3
1948	216.6
1949	190.7
1950	176.7
(1st Quarter 1950—160.6)	
1951	210.8
(4th Quarter 1951—245.4)	
1952	224.5
1953	216.2
1954 (1st Quarter)	199.4
1954 (2d Quarter)	189.0
1954 (3d Quarter)	207.8
1954 (4th Quarter)	192.2
1955 (1st Quarter)	189.3
1955 (2d Quarter)	212.4

cause in keeping construction costs from rising. However, bidders have evidently reached the limits in devices for cutting prices and trimming profits and the effects of rising labor and materials costs will now become apparent in bid prices.

This point which was reached in the second quarter of 1955 has been anticipated by this department during the past year and it is our opinion that the rise in construction costs will continue for some quarters to come.

The accompanying tabulation shows the California Highway Construction Cost Index by years from 1940 through 1953 and by quarters for 1954 and 1955.



CALIFORNIA DIVISION OF HIGHWAYS AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Crusher run base, per ton	Plant mix surfacing, per ton	Asphalt concrete pavement, per ton	PCC pavement per cu. yd.	PCC structures per cu. yd.	Bar reinforcing steel, per lb.	Structural steel, per lb.
1940	$0 22	$1 54	$2 19	$2 97	$7 68	$18 33	$0 040	$0 083
1941	0 26	2 31	2 84	3 18	7 54	23 31	0 053	0 107
1942	0 35	2 81	4 C2	4 16	9 62	29 48	0 073	0 103
1943	0 42	2 26	3 71	4 76	11 48	31 76	0 059	0 080
1944	0 50	2 45	4 10	4 50	10 46	31 99	0 054	0 132
1945	0 51	2 42	4 20	4 88	10 90	37 20	0 059	0 102
1946	0 41	2 45	4 00	4 68	9 48	37 38	0 060	0 099
1947	0 46	2 42	4 32	5 38	12 38	48 44	0 080	0 138
1948	0 55	2 43	4 30	5 38	13 04	49 86	0 092	0 126
1949	0 49	2 67	4 67	4 64	12 28	48 67	0 096	0 117
1950	0 40	2 25	4 26	3 75	11 11	43 45	0 079	0 094
1951	0 49	2 62	4 34	5 00	12 21	47 22	0 102	0 159
1952	0 56	2 99	5 00	4 38	13 42	48 08	0 098	0 150
1953	0 51	*2 14	5 31	4 58	12 74	50 59	0 093	0 133
1st Quarter 1954	0 45	2 28	4 23	4 78	14 89	47 52	0 092	0 126
2d Quarter 1954	0 38	2 09	4 29	5 18	14 28	47 12	0 093	0 114
3d Quarter 1954	0 43	1 85	4 68	7 00	12 63	49 59	0 095	0 162
4th Quarter 1954	0 35	1 78	4 83	....	13 13	46 08	0 094	0 135
1st Quarter 1955	0 39	1 69	4 55	....	13 44	40 66	0 095	0 140
2d Quarter 1955	0 42	1 99	5 39	....	14 46	51 36	0 098	0 136

* Untreated rock base substituted for crusher run base at this point.

Inspection of the average unit prices bid during the second quarter of 1955 for the eight items upon which the California Highway Construction Cost Index is based (see accompanying tabulation) show marked increases for every item except structural steel. No bids were received for asphalt concrete so it does not enter the picture. Roadway excavation rose from $0.39 to $0.42 per cubic yard, a rise of 8 percent; untreated rock base was up 18 percent, from $1.69 to $1.99 per ton; plant-mixed surfacing rose a similar amount: 18 percent, from $4.55 to $5.39 per ton; Portland cement concrete pavement was up only 7 percent, $13.44 to $14.46 per cubic yard; structure concrete made the greatest jump, 26 percent, from $40.66 to $51.36 per cubic yard; bar reinforcing steel rose only 3 percent, from $0.095 to $0.098 per pound; and structural steel dropped 3 percent, $0.140 to $0.136 per pound.

It is a foregone conclusion that under the recent wage increases given to labor in the steel industry steel prices will rise appreciably in the immediate future. During the month of July a raise of $7.50 per ton ($0.004 per pound) was placed in effect.

The accompanying chart showing the California Highway Construction Cost Index, the Engineering News-Record Construction Cost Index and the United States Bureau of Public Roads Composite Mile Index compares the three all reduced to the 1940 = 100 base.

The Engineering News-Record Index which comprises all types of construction is nation-wide in scope. For the second quarter of 1955 this Index was up 1.2 percent over the first quarter of 1955.

The U. S. Bureau of Public Roads Composite Mile Index was down 0.4 percent in the first quarter of 1955 from the fourth quarter of 1954. Figures on this Index for the second quarter of 1955 are not available at this writing.

To present a gauge on competition among bidders there are attached tabulations of the average number of bidders for various sizes of road and bridge contracts for the first six months of 1955 and for the fiscal year from July 1, 1954, to June 30, 1955. It will be noted that the average number of bidders is down slightly from the preceding fiscal year and for the first six months of 1955 it is considerably below the first six months of 1954.

On June 30, 1955, there were 800 contractors prequalified to bid on state highway projects with an estimated combined bidding capacity of $1,595,850,000.

NUMBER AND SIZE OF PROJECTS, TOTAL BID VALUES AND AVERAGE NUMBER OF BIDDERS

(July 1, 1954, to June 30, 1955)

Project volume	Up to $50,000	$50,000 to $100,000	$100,000 to $250,000	$250,000 to $500,000	$500,000 to $1,000,000	Over $1,000,000	All projects
Road projects							
No. of projects	144	37	54	20	16	6	277
Total value*	$2,555,938	$2,733,005	$8,744,539	$7,025,543	$10,308,521	$7,888,195	$39,255,842
Avg. No. bidders	4 6	5 4	5 3	6 3	8 4	10 2	5 3
Structure projects							
No. of projects	32	12	8	2	2	3	59
Total value*	$514,535	$759,131	$1,227,519	$738,252	$1,660,034	$8,194,509	$13,204,180
Avg. No. bidders	5 1	8 5	8 5	5 5	6 5	7 3	5 4
Combination projects							
No. of projects					1	14	15
Total value*					$729,549	$30,030,158	$30,759,517
Avg. No. bidders					2 0	7.9	7 5
Summary							
No. of projects	176	49	62	22	19	23	351
Total value*	$3,170,573	$3,502,135	$9,972,158	$7,753,795	$12,698,104	$45,112,973	$83,219,539
Avg. No. bidders	4 7	6 2	5 7	5 2	7 9	8 4	5.5

* Bid items only.

Total Average Bidders by Months

	Jan.	Feb.	Mar.	Apr.	May	June	Avg. for six months
1955	8 5	5 8	5 7	5 5	5 0	4 4	5 3
1954	7 5	8 4	8 8	6 9	5 7	6.3	7 0

NUMBER AND SIZE OF PROJECTS, TOTAL BID VALUES AND AVERAGE NUMBER OF BIDDERS

(January 1, 1955, to June 30, 1955)

Project volume	Up to $50,000	$50,000 to $100,000	$100,000 to $260,000	$250,000 to $600,000	$500,000 to $1,000,000	Over $1,000,000	All projects
Road projects							
No. of projects	276	77	89	33	25	9	609
Total value*	$4,672,324	$6,472,669	$14,340,010	$11,622,612	$15,040,776	$11,946,878	$63,996,069
Avg. No. bidders	4.7	5.8	6.2	7.3	8.4	9.7	6.6
Structure projects							
No. of projects	49	16	15	5	8	5	99
Total value*	$977,689	$1,081,319	$2,327,665	$2,215,127	$6,452,265	$11,091,149	$23,145,196
Avg. No. bidders	6.1	8.9	10.3	10.5	8.1	9.0	7.7
Combination projects							
No. of projects					2	28	30
Total value*					$1,647,176	$63,662,725	$65,209,901
Avg. No. bidders					6.0	9.1	8.9
Summary							
No. of projects	325	93	104	39	35	42	638
Total value*	$5,660,013	$6,663,888	$16,667,665	$13,737,639	$23,040,208	$86,700,752	$162,360,166
Avg. No. bidders	4.9	6.3	6.8	7.8	8.2	9.2	5.1

* Bid items only.

Total Average Bidders by Month

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Avg. for year
1964-55	6.7	6.0	6.6	7.9	7.0	6.4	8.6	6.8	6.7	5.6	6.0	4.4	6.1
1963-54	6.2	6.9	6.4	7.6	7.4	7.7	7.6	8.4	8.8	6.9	6.7	6.3	6.9

In arriving at a practical figure for combined bidding capacity, ratings in excess of $20,000,000 have been entered at the $20,000,000 figure.

Last year at this time there were 780 prequalified contractors with a combined bidding capacity of $1,472,-445,300, using the $20,000,000 cut-off figure.

Based on their maximum rating the 800 prequalified contractors with a bidding capacity of $1,600,000,000 are grouped as follows:

10,000,000 and over	45
5,000,000 to 10,000,000	81
2,500,000 to 5,000,000	142
1,500,000 to 2,500,000	202
1,000,000 to 1,500,000	247
500,000 to 1,000,000	273
250,000 to 500,000	517
100,000 to 250,000	667
50,000 to 100,000	766
up to 50,000	800

As a comparison of the work of the Division of Highways to this bidding capacity it should be noted that on June 30, 1955, the division had under way 381 contracts with a total value of $238,031,500. This is an all time high and compares with the previous high of $226,988,600 on May 31, 1955, when 321 contracts were under way.

PATIENCE PAYS

Patience is one of the most valuable assets a driver can have. There are many situations on the streets and highways which you cannot help but they all clear up eventually and fretting will not get you to your destination any sooner.

CALIFORNIA

California ranges in width from 150 to 375 miles.

TRIBUTE TO MAGAZINE

PACIFIC GAS & ELECTRIC CO.
San Francisco, California

MR. KENNETH C. ADAMS, *Editor*

This is a tribute to your magazine which is circulated through the entire department when I have finished with it. Everyone enjoys it and it brings a clearer understanding of the problems of highway construction and maintenance. This alone makes publication worthwhile.

L. A. KRIEG

MAGAZINE IN SCHOOLS

MODESTO CITY SCHOOLS

K. C. ADAMS, *Editor*

I wish to express to you my appreciation for the very fine magazine which you edit and cause to be published for the citizens of our great State.

I read the magazine regularly and faithfully, not only for its news and report of highway development throughout the State, but it is a fine example of good reporting and wonderful photography.

I always take the magazine home where our three children read through it also. It serves as a good geography book for them as they associate what they have read in your magazine with scenes and developments experienced in our travels throughout the State. Then I forward the magazine to one of our school libraries where I observe it is read and used also.

Sincerely,

ROBERT T. ELLIOTT

SUPERVISORS VOICE THANKS

THE BOARD OF SUPERVISORS
CONTRA COSTA COUNTY

MR. FRANK B. DURKEE

DEAR MR. DURKEE: Mr. E. R. Foley, accompanied by Mr. P. A. Carmichael, made an excellent presentation to the board of supervisors of the inventory of the rural roads in Contra Costa County.

We are especially pleased with the contents of the report, and realize that the data will be of great value to not only our Public Works Department and the Planning Commission, but to every department in our county.

A resolution commending the State Department of Public Works and the United States Bureau of Public Roads for this outstanding contribution to the people of Contra Costa County, was unanimously adopted by the board of supervisors. We were all greatly impressed with the vision, interest, and the months of labor that had gone into the preparation of such a complete study.

We wish to thank you for the inventory, which is evidence again of the value of cooperation between governmental agencies.

H. L. CUMMINGS, Chairman

State Fair

Many New Highways Will Expedite Travel to Event

Two of California's most valuable resources, "Sunshine and Water," have been chosen for the theme of the California State Fair and Exposition when it opens its gates this year on September 1st. To emphasize the theme and the importance of these two resources in the economy of the State, containers of water from each of the 58 counties will be transported by highway, rail, pack animal, and air to the fairgrounds and mixed to signify the unity that exists in the State. Governor Goodwin J. Knight will officiate at the ceremonies.

Eleven beautiful maidens will pour the waters from all over the State into a pool to form a crystal-clear solution during opening day ceremonies. These maidens will be selected from beauties from nearly every county and will be finalists in the "Maid of California" contest. The winner will be crowned by the State's first lady, Mrs. Virginia Knight, wife of the Governor.

Spectacular Growth

The State Fair will again dramatize the spectacular growth and development of the State. Forty-four counties and eight foreign countries have indicated that they will display the wealth of their lands in the huge counties building in the center of the fairgrounds. The youngsters of the State will compete in many divisions, including livestock, 4-H Club, Future Farmers of America, Junior Grange Activities, and a "Sew It Yourself" fashion sewing contest. The State Fair Horseshow, oldest continuous horseshow in the West, will exhibit fine animals and experienced riding traditional to this event. The Hall of Flowers will show the blooms and greenery of California in its new building. Wines, poultry, rabbits, art, grain, cooking, and a thousand other items and commodities produced by the State will be judged and displayed in this theme of "Sunshine and Water" to dramatize the role of California in this expanding country of ours.

Record Attendance Expected

Records in attendance are expected to topple this year at this granddaddy of western expositions, as they did last year when 812,204 people came through the gates.

Thousands of Californians and out-of-state visitors will travel to the Fair over new state highways, expressways and freeways.

Last year the pari-mutuel play also set a new high of $4,144,522 for the nine-day season, and it is anticipated that this record may also fall this September, with a meet that will feature, for the first time, a $20,000 Governor's Handicap on September 8th. In addition, there will be the Inaugural and Director's Handicaps, at $5,000 added, and the Sacramento and President's Stakes, also at $5,000 added. All in all, there will be a total of 28 purses at $2,000 or more during the State Fair meeting.

The 16 directors of the Fair are very enthusiastic about this year's events, and they openly admit that they are excited about the new entertainment feature which will be entirely different from previous evening shows. In years past, the night shows have presented top stars of stage and screen in elaborate vaudeville-type performances. This year, however, each individual show will be devoted entirely to the music of a famous American composer with music by the Hollywood Bowl Pops Orchestra, special lighting and set decorations, and an array of top Hollywood performers to interpret the music. From September 1st through 3d, for example, Gordon MacRae will interpret the music of Rogers and Hammerstein, Jeanette MacDonald follows on September 4th through 6th with the compositions of Jerome Kern. George Gershwin's music will be performed on two special nights, September 7th and 8th, with Paul Whiteman conducting the 50-piece orchestra. The final three nights of the Fair, Margaret Whiting will present the songs of Cole Porter.

For those who have interests in other things, there are items of general and specific interest throughout the 207-acre fairgrounds. Sale of exhibit and show space has already outstripped last year's total. Indications are that the 5,000 head of livestock entered in competition in 1954 will be matched, if not surpassed, this year. Two new foreign country exhibits, Japan and Belgium, have been added to the list of the Netherlands, Denmark, Pakistan, the United Kingdom, Finland, and Sweden. These and many more make the Fair this year a bigger and a better exposition of our State's growth and development.

Considered to be one of the five great state fairs in the Nation, the California State Fair thrives on curiosity of the fairgoer to look, to listen, and to compare breeds, quality, production, and popularity of various livestock, goods, and products. It is a "school" for education through comparison and demonstration. It is an institution that requires, for example, 3,000 bales of hay, 150 blocks of salt lick, 300 heads of lettuce, 10,000 electric light bulbs, 1,000,000 plants, shrubs, trees, and flowers, 13,500 premium ribbons, and a list of materials and equipment at least a mile long to display products from our State.

The Fair has been called "a tour of California on 207 acres," and the grounds literally bulge with items, activity, and pride. In addition to the entertainment at night, the horseshow, the horse racing, the county and foreign country exhibits, livestock displays, and the contests, there will be fireworks, refreshments, clowns, bands, majorettes, souvenirs, gadgets, recreation, vaudeville, homemaking, foods, and carnival fun to delight the thousands of fairgoers who travel over modern state highways to celebrate another year of progress, a year of tremendous growth, by their State of California.

All Highways Lead to Sacramento Exposition

San Marcos Pass

Historic Highway Used by Fremont Is Being Improved

By E. J. L. PETERSON, District Engineer

Improvement of a portion of the historic route taken by Lieutenant Fremont over the San Marcos Pass in his conquest of Santa Barbara is provided for in the contract awarded to John F. Blakemore of El Monte on March 17, 1955. This contract, amounting to $830,000, includes the grading and surfacing with plant-mixed surfacing on cement treated base of about two miles of State Sign Route 150 between Painted Cave Road, approximately six miles north of Santa Barbara, and San Marcos Pass.

On Christmas Day, 1846, during the war with Mexico, Lieutenant John Charles Fremont executed a military maneuver that secured the Town of Santa Barbara for American forces, ensured a place for himself in California history and demonstrated the feasibility of passage over the now historic San Marcos Pass.

During the war with Mexico, Lieutenant Fremont was in command of the California battalion consisting of 500 men, several pieces of artillery and the usual wagon train. In November of 1846 he left his camping place in the San Juan Valley (in what is now Monterey County) and marched south to take possession of Santa Barbara preparatory to engaging the Mexican forces at Los Angeles. His intended route of travel included passage over the Santa Ynez Mountains by way of the narrow and precipitous Gaviota Pass.

Warned of Ambush

While encamped north of the pass at Rancho Tinquaic, Lieutenant Fremont received warning from the owner of the Rancho, Benjamin Foxen, that Mexican forces had prepared an ambush for him in the narrow gorge. Fremont's only alternate route lay over the San Marcos Pass which at that time was a wild and narrow horse trail.

Despite warnings that a march over San Marcos Pass was impossible, Fremont attempted the crossing and after days of heart-breaking labor and suffering the loss of several men and 300 horses, he stood on the summit.

By successfully crossing the San Marcos Pass and by-passing the Gaviota Gorge where the Mexican forces lay in wait, Fremont was able to secure Santa Barbara without a shot being fired. Three weeks after his historic march, California was ceded to the United States.

Old Toll Wagon Road

Fremont's route over San Marcos was eventually developed and operated as a toll wagon road by the Santa Barbara and Santa Ynez Turnpike Company until 1898 when the road was purchased by Santa Barbara County. The first modern improvement of this highway was undertaken about 1925 to provide easier access to the virgin area of the Santa Ynez Mountains. The portion northerly from San Marcos Pass was constructed by the U. S. Bureau of Public Roads as a forest access road. The County of Santa Barbara constructed the southerly portion to provide recreational access for the residents in and around the City of Santa Barbara.

In 1929 this road was taken into the State Highway System. Improvement has long been desired, but until recently, with the exception of one major relocation contract in 1926, only minor improvements and maintenance were accomplished.

The first major improvement of this road provided for a complete relocation which eliminated the steep grades and sharp curves between Route 2 (US 101) and Painted Cave Road, a length of six miles.

Cachuma Dam Relocation

In 1950 an important event occurred which has stimulated improvement of this road. In order to increase the supply of water for the rapidly growing south coastal section of Santa Barbara County and as a flood control measure, the U. S. Bureau of Reclamation undertook construction of Cachuma Dam on the Santa Ynez River. The impetus of this dam upon the highway has been two-fold. First, the waters impounded behind the dam inundated portions of the existing highway and thereby required immediate relocation. Secondly, the lake created behind the dam provided recreational potentialities.

Approximately seven miles of this route between Hilton Canyon and Hot Springs Canyon had to be relocated above the high-water level of the reservoir lake. This relocation provided an opportunity for substantial improvement of the affected section of this highway. Two contracts were immediately undertaken and by the latter part of 1951 were completed.

The Santa Ynez Mountain area has always provided a recreational outlet for the people living along the adjacent coastal areas. The general area has been under development for years, but the new reservoir lake opened additional areas for fishing, camping, boating, hiking, riding and other outdoor sports. The public was quick to realize these possibilities and there has been a marked increase in the use of the area. All facilities are being expanded to accommodate this demand and consequently, traffic requirements are reaching proportions which the present highway cannot properly handle.

New Contract Underway

The contract recently awarded to John F. Blakemore is for the improvement of another section of poor alignment on this mountainous highway. The original road consisted of a 16-foot to 18-foot bituminous macadam pavement. It had numerous very sharp

Type of curve which will be eliminated on San Marcos Pass Highway. This view is looking north.

curves with a radii of less than 100 feet with some being only 50 feet, and short sections of very steep grade. Many of the original fills on which the road had been built have settled, or have experienced slipouts, making further variations in grade and alignment. Inadequate sight distance and lane width add to the hazards and tensions of driving. As a result the accident rate on this road is high.

Owing to these deficiencies most of the existing highway is being abandoned in order to achieve adequate standard. The new roadway will consist of a 32-foot all-paved section.

This road, when completed, will permit public traffic to maintain a maximum safe speed of 40 miles per hour. The maximum grade encountered will be only slightly in excess of 7 percent, which is a considerable improvement when compared with the grades on the existing road.

Geological and Construction Difficulties

An appreciation of the magnitude of this improvement may be gained only if viewed against the backdrop of the terrain. Beginning on the coastal plane at an elevation of 170 feet, this highway rises to an elevation of 2,225 feet at San Marcos Pass in a distance of less than seven miles. The region is mountainous with steep sloping canyons covered with dense brush and stunted tree growths. Massive sandstone cliffs control the topographic features and the sandstones form prominent knobby outcroppings on the ridges.

The route traverses an area of unstable geological formations. This instability is the result of the sedimentary rock formations having been subjected to folding and faulting. The new alignment will involve the excavation of approximately 700,000 cubic yards of earth and will require cuts ranging up to 110 feet at center line and 340 feet along the slope. Embankments will be as high as 135 feet at center line and 360 feet along the slope. The new alignment and grades were therefore critical as minor changes affected the resulting stability of cut slopes and embankment foundations. This problem was further complicated by porous sandstone beds which contained excessive ground water. This situation has caused slipouts on the existing highway requiring several changes in its original alignment and grade. To prevent this from occurring on the new road, extensive horizontal and vertical drains will be installed where such water is encountered.

The carrying of traffic through construction in this precipitous mountain terrain would have been difficult and expensive. Fortunately, it was possible to offset the new alignment sufficiently to permit most of the existing road to remain in service until the new roadway is completed. Minor

CALIFORNIA HIGHWAY COMMISSION WORKS ON NEXT BUDGET

At its June meeting in Sacramento, the California Highway Commission began preparation of its 1956-57 budget. Shown in the midst of their work, left to right, are: Commissioners Fred W. Speers, Escondido; James A. Guthrie, Vice Chairman, San Bernardino; H. Stephen Chase, Sacramento; Director of Public Works Frank B. Durkee, Chairman; C. A. Maghetti, Secretary, Davis; Chester H. Warlow, Fresno; F. Walter Sandelin, Ukiah, and Robert E. McClure, Santa Monica.

temporary detours were planned to avoid the necessity of public traffic having to traverse through the construction zone where the new and old alignments conflict except at the beginning and end of the project.

Robert C. Kidd is project manager for John I. Blakemore and M. A. Dawson is resident engineer on the project for the Division of Highways.

LIKES COST INDEX ARTICLES

La Canada, California

Mr. Kenneth C. Adams, *Editor*

Thank you for sending me *California Highways and Public Works.* It is an excellent source of information regarding some of this State's greatest growing assets its highways and public works. No one who has ever read your fine magazine can dispute that fact.

At this time I must also add that the articles by Mr. Wilson and his associates on construction costs are invaluable to those who like myself are concerned with the business end of construction. Any one familiar with statistical techniques and the effort needed to obtain the data that is so ably presented in those succinct articles must admire their workmanship.

James P. ApRoberts
Construction Cost Specialist

Retirements *from* Service

Carleton Pierson

Carleton Pierson, Supervising Contract and Building Specifications Writer, has retired after more than 43 years continuous service with the

Division of Architecture. He formally quit his post on September 30th, but will spend two months on terminal leave beginning July 29, 1955.

A farewell dinner was held for Pierson at the Capitol Inn in West Sacramento on Friday evening, July 22d, by his many friends and fellow employees. The group presented Pierson with a gift to commemorate his retirement. In point of service, Pierson is the division's oldest employee.

Pierson is well known throughout the State of California, particularly by contractors and other allied industries with whom his position has brought him in contact for many years. He was born and raised in Sacramento where he attended public schools and later the University Farm School at

. . . Continued on page 49

Raymond L. Beuthel

Raymond L. Beuthel, Office Engineer of District XI, retired on July 1st to conclude a career with the Division of Highways which began in July, 1914, and was continuous until his retirement except for two short interruptions.

RAYMOND L. BEUTHEL

Born in Burlington, Iowa, and educated there and in Bellingham, Washington, Beuthel came to California in 1907, and attended high school in Los Angeles and Fresno, and later studied at the University of California. He joined the California Highway Commission staff as an engineering assistant in 1914.

In 1923 he was appointed office engineer in District VI, Fresno, serving first under J. B. Woodson and then under E. E. Wallace. When District XI was formed in 1933 to administer state highways in San Diego and Imperial Counties and the eastern half of Riverside County, Wallace was appointed as its district engineer and Beuthel accompanied him to San Diego. After serving as district construction engineer for two years, Beuthel was assigned as office engineer and concurrently fulfilled the duties of city and county cooperative projects engineer for the district.

Beuthel served in the Army in World War I. He is a member of the San Diego Engineers Club. He and Mrs. Beuthel plan to do some traveling and to devote considerable time to their home workshop and high-fidelity and radio hobbies.

GASOLINE CONSUMPTION IN U. S.

Gasoline consumption in the United States hit the 51,100,293,000 gallon mark in 1954.

Harry L. Kile

Harry L. Kile, budget engineer for the Division of Highways and administrative engineer for the division's Planning Department, retired on July

1, 1955, after more than 22 years of state service. He was honored by his co-workers at a luncheon in Sacramento on June 30th.

Kile has been recognized nationally, as well as in California, for his pioneer work in forecasting the available amounts of revenue for highway improvements which would be derived from highway user taxes. His advance estimates, based on a portion of the traffic data obtained for design purposes, have for a number of years proved invaluable in state highway planning and budgeting. These estimates for future revenues have made possible the integration of planning to conform to the controls established by law for expenditure of highway construction funds.

. . . Continued on page 49

F. N. Roberts

F. N. "Bob" Roberts, Administrative and Planning Engineer for the Division of Highways District IX Office in Bishop retired July 1st, ending a 24-year career with the State. All of Roberts' state service was with District IX, where he started work as a senior engineering aid in 1931.

F. N. ROBERTS

Some of his early assignments included: assistant resident engineer on the construction of the section of US 395 between Conway Summit and Bodie Road in 1937, and between Diaz Lake and Alabama Gates the following year. He was resident engineer on the Jayhawker Trail project across the Slate Range and Panamint Valley in 1948-49.

He was promoted to construction engineer for District IX in 1951 and was made administrative and planning engineer one year later. As administrative engineer he also had charge of all city and county cooperative projects within the district.

Roberts' military service includes both World Wars I and II. During 1918 and 1919 he was a private with the 31st Aero Squadron in France. Between wars he became an officer in the Reserve Corps and in August, 1941, was reassigned as commanding officer of his old War I unit, redesignated as the 31st Material Squadron. He was stationed first in Alaska and later in Europe. At present he holds the rank of lieutenant colonel in the Air Force Reserve.

Roberts was born in Grant City, Missouri, and came to California in 1925.

He and his wife live at 387 North Fowler Street in Bishop. They have a son and a daughter and five grandchildren.

William F. Axtman

After 24 years of service, W. F. "Bill" Axtman, District Maintenance Engineer, Administration, of District VII, retired on August 1, 1955.

Bill gained his early engineering experience with the Los Angeles County Road Department. After four years of service with the county, he started work for the State Division of Highways on August 1, 1930, as an assistant resident engineer in District VII.

In December, 1931, he transferred to District VIII as assistant resident engineer on a day labor camp project. He returned to District VII in February, 1932. In June, 1937, he transferred from construction to maintenance where he continued working until his retirement.

Devotion to duty and sincerity of purpose have earned for Bill the respect and admiration of all who came in contact with him.

All Bill's friends wish him many happy years of retirement. Much of his time will be devoted to his hobbies that include photography and furniture refinishing, in both of which fields he is unusually talented.

Bill will continue to reside at 1305 Monterey Road in South Pasadena and extends a cordial invitation to his many friends to visit him at his home whenever they can.

Frank R. Austgen

On July 1, 1955, Frank R. Austgen, Area Construction Supervisor for the State Division of Architecture, retired after having served 33½ years with the division.

Austgen was succeeded by C. T. Troop, who has been district construction supervisor in charge of the San Francisco district for the last three years.

FRANK R. AUSTGEN

Austgen, with headquarters at Los Angeles, was in charge of all state building construction in the 12 southern counties of California during the last five years, during which time he was responsible for construction supervision running as high as $30,000,000 annually. He was senior member of the Division of Architecture field forces, both in rank and in point of service, having been originally employed by the State in December, 1921.

Educated in Chicago

Austgen is married to the former Agnes C. Wilson, and they have one daughter, Mrs. Joyce Batson. Austgen was born February 8, 1893, at Chicago, Illinois. He was educated in the public schools of Chicago, and he learned the construction business by serving an apprenticeship in Chicago.

From 1915 to 1917 he held a civil service position for the City of Detroit, being in charge of maintenance of all fire department buildings in that city. From July, 1917, to January, 1919, he was a civilian employee of the Federal Government, on the repair and reconditioning of interned German ships at Charleston, South Carolina. During the years 1919 and 1920 he was employed in various capacities in the construction industry in Florida and Texas, arriving at Southern California in the latter year.

Takes State Position

In December, 1921, he took a temporary position with the State Division of Architecture, guaranteeing to

. . . Continued on page 50

HARRY L. KILE

Continued from page 47 . . .

Before entering state service, Kile had spent more than 25 years in engineering work, a major part of it with the Western Pacific Railroad.

Born in Canton, Kansas, Kile attended the College of Emporia and University of Kansas. His first engineering job was in Utah and Nevada in 1905-06 on the location of the Oregon Short Line Railroad. Later he was employed on the Umatilla Irrigation Project in eastern Oregon and on the construction of the Chicago, Milwaukee and Puget Sound Railroad through Montana and Idaho.

In 1910 Kile joined the Western Pacific and remained with that railroad until 1926, except for 2½ years of military service in World War I. He rose to the position of division engineer.

During his World War I service, Kile spent more than two years as an officer on railroad construction and restoration in Europe.

From 1926 to 1931 he was engaged in private construction and manufacturing in California. In 1931 he took a temporary position as a location and construction engineer with the Division of Highways, but returned to private engineering work in the following year. He joined the division as a permanent employee in November, 1933.

One of his first assignments was the planning, organization and direction of the California Highway Transportation Survey of 1934, in cooperation with the U. S. Bureau of Public Roads. This was the first survey of its kind in the Nation but was subsequently the model for many state-wide highway planning surveys.

The value of this vast fund of information to the highway planner and designer depended on its being kept up to date, supplemented by further study of the type, volume, characteristics and behavior of traffic including an analysis of accidents. This concept is taken for granted now, but two decades ago it represented a tremendous advance in highway engineering practice. In these early years, the emphasis was on the physical stability of the highway—partly because of the

. . . Continued on page 64

Earl A. Parker

E. A. "Ace" Parker, senior highway engineer in District VII, retired from state service on August 1, 1955, after a long and varied career in the construction field. He was honored by a retirement dinner Friday night, August 5th, by his many friends in the State Division of Highways and among local contractors.


EARL A. PARKER

"Ace" was born in Waitsfield, Vermont, and received his formal education at Norwich University. After leaving school his first engineering assignment was with a survey party on railroad, irrigation and drainage projects. During World War I "Ace" was a first lieutenant and served as Commanding Officer of Company "E," 305th Infantry, through the second phase of Meuse-Argonne.

From 1919 to 1925 he was resident engineer with the State Highway Departments of New Hampshire, Illinois, and Missouri. In between service with these highway departments, he was superintendent for contractors on three occasions. In 1925 "Ace" went to work for the City of Los Angeles, becoming supervisor of construction on contract work for the city. He was responsible for all types of street, storm drain, sewer, and bridge construction until 1933.

He first started to work for the State Division of Highways in December, 1933, as resident engineer on Route 26 near West Covina. He served as resident engineer on various jobs in District VII until 1942.

During World War II, "Ace" left the State to serve as resident engineer with the U. S. E. D. on the Pan-American Highway in Costa Rica and Panama. Later he became contractor's representative on bridge construction on the Alcan Highway in Canada.

He returned to the Division of Highways in December, 1943. With construction at a standstill during the

. . . Continued on page 64

CARLETON PIERSON

Continued from page 47 . . .

Davis. Having been born within sight of the Capitol dome may have had some effect on his later life, for oddly enough, his first earned dollar came from the State when he served as a page in the State Senate in 1907. School vacations found Pierson in survey parties, the last one being with the Western Pacific when they built the railroad through Sacramento in 1907.

Chance changed the course of his young life and caused him to forsake the schooling that was leading to a farmer's life. He was enrolled in the University Farm School at Davis when he chanced to overhear the then acting State Architect, the late Maury I. Diggs, make a remark to a State Senator that his office needed young men—that there was a wonderful opportunity for learning. It was at that moment that any interest he may have had in becoming a dirt farmer began to wane, and it was only a few months later that he lost all interest in continuing his farm schooling.

With great courage, and with little to offer, he approached Nathaniel Ellery, who was State Engineer at the time, and applied for a job. Since there were no civil service formalities at that time, he was hired immediately and reported the following Monday morning to Mr. Diggs for assignment. This was November 27, 1911. Hiram Johnson was Governor at the time. Pierson states he did not inquire and did not know what his stipend was to be until two weeks had passed when he received from the State Treasurer one shiny $20 gold piece.

Pierson's first assignment was as an assistant to the office boy and consisted of making blueprints, running the mimeograph machine, proofreading specifications, mailing out plans and specifications, etc.

The office comprised five committee rooms on the fourth floor of the old Capitol Building where light and ventilation was derived from skylights. Temperatures were often over 105 degrees in the summer months, and air conditioning was as yet undreamed of.

. . . Continued on page 50

B. W. Latour

B. W. "Boots" Latour, veteran Division of Highways superintendent of the Madera maintenance territory, retired on July 1st after 37 years with the State.

Latour started to work for the division as a tractor operator on January 1, 1918.

All of Latour's state service has been with District VI. He supervised the first experimental mixing of oil with earth for road surfacing in the district in the mid 1920's and has a wide knowledge of the roads and maintenance operations in the southern San Joaquin Valley region.

During his early years Latour served as tractor operator, truck driver and blacksmith with the maintenance forces. He was appointed highway foreman in 1921 and became general maintenance foreman in 1924, one of the first appointees to this classification.

He was promoted to maintenance superintendent in 1929.

An ardent sports fan, Latour will spend a lot of his time after retirement attending local sports events. He intends to take in the World Series back east this fall. He will also devote time to hunting and fishing and pursuing his hobby of breeding racing pigeons. He has been awarded many medals and prizes for the performance of his birds.

Latour and his wife live at 400 Raton Avenue in Madera. They have a son and a daughter and seven grandchildren.

FRANK R. AUSTGEN

Continued from page 48 . . .

stay for two weeks only. This two-week period, however, lasted for an unbroken third of a century.

In 1927 he became general foreman and inspector over all construction work in what is now District 5B, which includes all of the territory east of Los Angeles, south of the desert, and north of San Diego. In August, 1932, he was promoted to the class of senior engineer of general construction, and placed in charge of our present District 10, which includes Santa Barbara and Ventura Counties.

On Big Projects

In May of 1939, he was transferred back to present District 5A, then known as the East of Los Angeles District. He remained in this position for nine years, until the year 1948, when he was placed in charge of all direct construction activities in the Los Angeles area.

In April, 1950, he succeeded C. L. Weber, on the latter's retirement, and since that date has been Area III construction supervisor, being in charge of all of the construction activities of the Division of Architecture south of Paso Robles and Delano, and east of the Sierra Nevadas. During his incumbency in this post he supervised the construction work at more than 150 sites, the total amount of construction at which was in excess of $116,000,000. During this period he was responsible for direction and supervision of over 2,500 individuals of state forces.

CARLETON PIERSON

Continued from page 49 . . .

The work proved interesting to Pierson, and in not too quick succession he was assigned duties as timekeeper on a construction project, junior draftsman, senior draftsman, electrical draftsman, structural draftsman, estimator, inspector, specification writer, and supervising contract and building specification writer. Pierson has held the latter positon for the past 26 years.

Pierson moved to Woodland in 1917 where he married Dorothy Ross. They had no children and his wife passed away in 1941. He continues to make his residence in Woodland and bears somewhere near a record for commuting, having traveled over 415,000 miles back and forth to Sacramento. He plans to spend his retirement in traveling, hunting, fishing, and may take up his golf where he left off 20 years ago.

Ted Jain

Ted Jain, City and County Projects Engineer for the Division of Highways Office in Marysville, retired on June 15th, after serving with the State for 25 years.

At the time of his retirement, Jain had charge of administering the Federal Aid Secondary road program for the 11 counties in District III, which includes Glenn, Colusa, Butte, Sutter, Yuba, Yolo, Sacramento, Sierra, Nevada, Placer and El Dorado. He also had responsibility for the expenditure of state gasoline tax funds on city streets within the district.

Earlier, as a design engineer, Jain was in charge of the squad which prepared the plans for the North Sacramento Freeway. He was promoted to city projects engineer for District III in 1949, and one year later also assumed the duties of administering the F. A. S. program.

Jain, who was born in Boulder, Colorado, attended grade school in Boulder and high school in Greybull, Wyoming. After coming to California in 1924 he studied at the San Diego State College.

From 1927 to 1930 he was an engineering draftsman with the city engineer's office in San Diego.

Jain came to work for the State Division of Highways in 1930 and for the first three years worked as a draftsman and later as a junior highway engineer with District VIII at San Bernardino. After a short assignment in District V (San Luis Obispo) he transferred, in 1934, to District III, and remained in that district until his retirement.

During World War II he was a Navy officer, serving in the Pacific area with the Seabees.

Jain and his wife live at 1059 Marilyn Avenue in Yuba City.

Southern Freeways

Rapid Progress on Southland Projects

By JAMES L. NEEDHAM, Resident Engineer

Santa Ana Freeway

THE SANTA ANA Freeway, between Browning Avenue and First Street, in and near the Cities of Santa Ana and Tustin in Orange County, consists of a four-lane divided highway about 2.5 miles in length, with frontage roads and interchange connections, surfaced with portland cement concrete pavement on cement-treated subgrade and plant-mixed surfacing on untreated rock base, and five reinforced concrete box girder bridges.

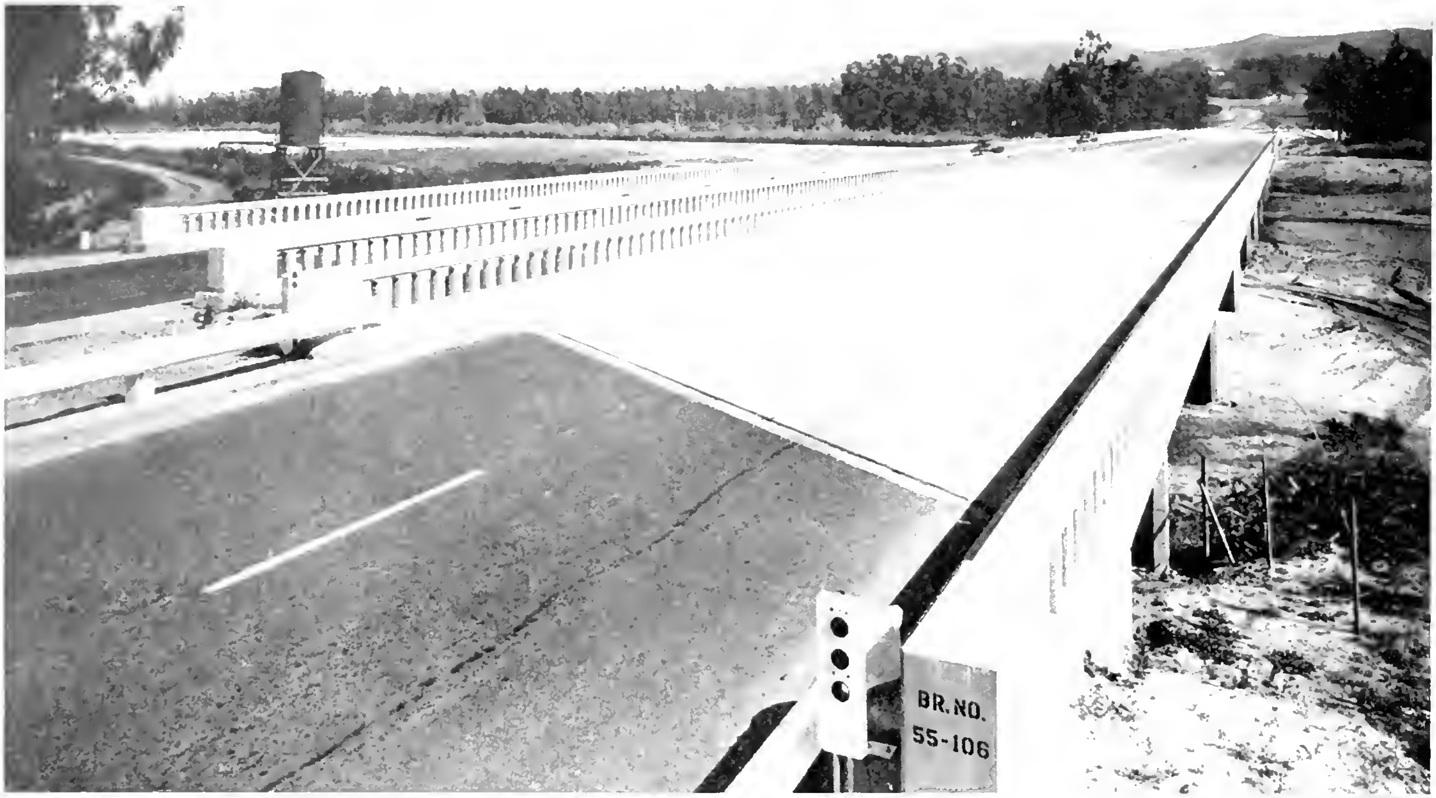
This section of the Santa Ana Freeway is the most southerly link presently under construction and is about 70 percent complete at this time. Construction of the five

Route 175 Freeway

STATE SIGN ROUTE 14 provides direct communication between the Cities of the Santa Monica Bay area, Los Angeles County, with Eastern Orange County, Riverside County and other eastern points. Portions of this route have been adopted as a freeway by the California Highway Commission.

There seems to be a variety of names being used to designate this highway. Near the eastern terminus at the Santa Ana Canyon Freeway near Olive, it is known locally as the "Orangethorpe Freeway" and the "Houston Street Freeway." Farther west in the Buena Vista Park

LEFT—View of Santa Ana Freeway southerly from First Street showing partially completed Main Street Undercrossing and the completed Route 2/43 separation structure at Tustin Avenue. RIGHT—Looking northerly on Santa Ana Freeway from Browning Avenue to First Street site of Red Hill Avenue Undercrossing in foreground.



UPPER View of Santa Ana River Bridge on Route 175 looking southerly from north end of bridge.
LOWER Shoofly for Santa Fe Railroad and start of bridge work at the Olive Undercrossing.

Santa Ana Freeway . . .

bridges is complete except for the finishing operations. The bridge work is briefly described as follows:

First Street Overcrossing

A reinforced concrete box girder bridge consisting of two spans about 116 feet in total length supported on a reinforced concrete bent and abutments and providing a clear roadway width of 56 feet and two 5-foot sidewalks.

Main Street Undercrossing

A reinforced concrete box girder bridge consisting of one span about 55 feet in total length supported on rein-

Route 175 Freeway . . .

area it is called the "Artesia Freeway" and at the western terminus it is referred to as the "Hermosa Beach Freeway." I will simply refer to it as the Route 175 Freeway until such time as a definite name is evolved.

Two Bridges

This section of the freeway presently under construction, is in Orange County and extends from Cypress Avenue (Route 180), on new alignment, to Santa Ana Canyon Freeway (Route 43). It consists of a four-lane divided highway about four miles in length with ramps, inter-

Looking northerly on Santa Ana Freeway from Tustin Avenue to First Street. The completed Route 2/43 separation structure is shown in foreground.

forced concrete abutments and providing for the freeway two clear roadway widths of 28 feet with a 36-foot dividing strip.

Route 2-43 Separation at Tustin Avenue

A reinforced concrete box girder bridge consisting of two adjacent structures each having four spans about 206 feet in total length supported on reinforced concrete abutments and piers and providing for the freeway two clear roadway widths of 28 feet, 36 feet apart.

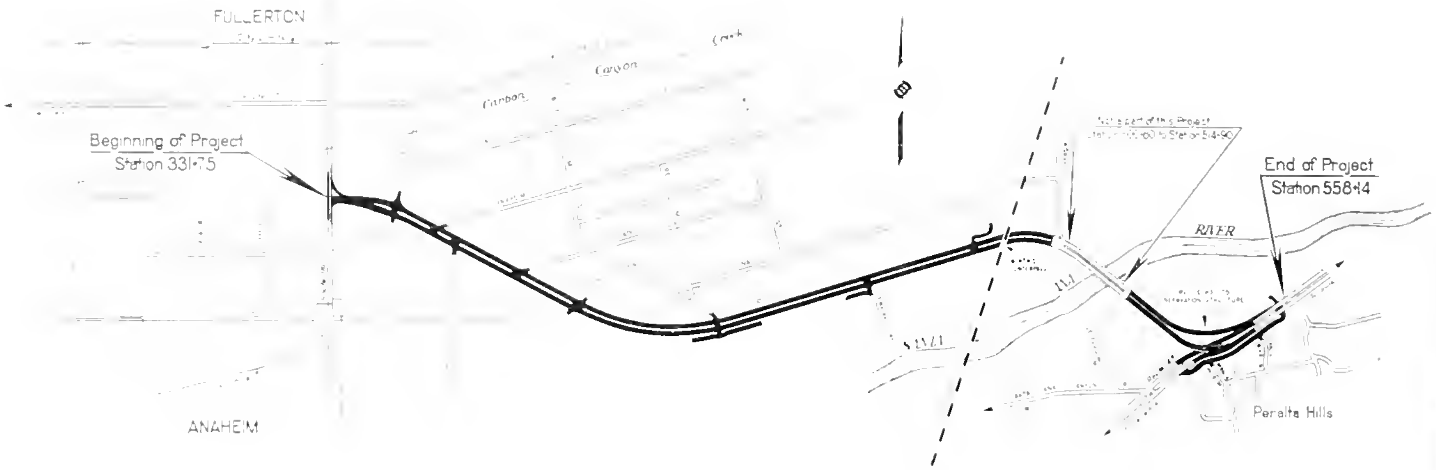
Newport Avenue Undercrossing

A reinforced concrete box girder bridge composed of two adjacent structures, one structure consisting of two spans and the other structure consisting of three spans about 180 feet and 227 feet in total length, respectively, supported on separate reinforced concrete piers and common reinforced abutments and providing for the freeway two 28-foot width clear roadways 36 feet apart.

change roadways and frontage roads surfaced with plant-mixed surfacing on untreated rock base over imported subbase material, and with two bridges. The existing double, reinforced concrete bridge across the Santa Ana River with approaches was constructed under a prior contract. The two bridges to be constructed are briefly described as follows:

A reinforced concrete box girder bridge about 102 feet long consisting of one span supported on reinforced concrete abutments on concrete pile foundations. The bridge will provide a clear roadway width of 28 feet for eastbound traffic on Route 175, going over westbound traffic on Route 43. The cast in place piling and structure excavation has been completed.

A steel plate girder bridge about 102 feet long consisting of two spans supported on reinforced concrete piers and abutments on concrete pile foundations. The contractor elected to use the cast-in-place concrete piles cast in drilled holes for this structure. The native soil consists of material varying from a fine river sand to a coarse



Santa Ana Freeway . . .

Red Hill Avenue Undercrossing

A reinforced concrete box girder bridge composed of two adjacent structures, each structure consisting of three spans about 142 feet in total length, supported on separate reinforced concrete piers and on common reinforced concrete abutments and providing 28-foot width clear roadways, 36 feet apart.

The ground areas adjacent to the separation structures at Newport Avenue, Red Hill Avenue, Main Street and Tustin Avenue (Route 2-43 Separation) were surcharged with additional height of fill for a period of 60 calendar days to an elevation 10 feet above the planned subgrade in order to consolidate the deeper soil strata. It was believed advisable to use this type of construction as a precaution in order to avoid later adverse settlement after the fills were completed. The wisdom of using the surcharges

Route 175 Freeway . . .

gravelly sand at the pile tip elevations. In order to eliminate excessive caving in the drilling operations the entire foundation area was first stabilized with sodium silicate solution placed by jetting to desired depth. This is the same solution called "water glass" that is used for preserving eggs. After treating, stabilization occurred in a few hours. Pile drilling operations then progressed very smoothly and no holes were lost due to caving. Concrete piers and abutments have been completed and structural steel placed. When completed the structure will carry the Santa Fe Railroad over the freeway.

The roadway excavation material encountered varied widely from a uniform river sand to a heavy wet clay. Approximately 30,000 cubic yards of the clayey excavation material from the Route 175-43 Separation area will have to be loaded and hauled by trucks to make the embankments from Placentia Avenue to North Street. The scrapers are also being used to haul and place the major

At easterly terminus of contract looking southerly on Route 43 at temporary connection for detour to new frontage road

UPPER—Looking northerly along construction toward end of job at First Street Overcrossing. CENTER—Looking southerly along construction from top of fill for Newport Avenue Undercrossing. LOWER—Looking southerly on construction from fill for Route 2. 43 separation at Tustin Avenue.

is demonstrated by the following record of settlements obtained during the surcharge period as follows:

Main Street Undercrossing	1.10 feet
Route 2-43 Separation (Tustin Ave.)	2.36 feet
Newport Avenue Undercrossing	1.27 feet
Red Hill Avenue Undercrossing	0.57 feet

Major Construction Items

Since the removal of the surcharge no further settlements have been noted.

In addition to the bridges other major construction consists of the following items:

290,000	cubic yards roadway excavation
3,000,000	station yards overhaul
670,000	tons imported borrow
170,000	tons imported base and subbase materials
23,500	tons plant-mixed surfacing
14,650	cubic yards portland cement concrete pavement
64,000	square yards cement treated subgrade
1,600	cubic yards class "B" P.C.C. (curbs and gutters)
26,500	linear feet 72-inch chain link fence
7,000	linear feet 18-inch to 24-inch reinforced concrete pipe with miscellaneous collection structures and with drainage pumping stations at First Street and at Main Street

The roadway excavation came from the area between Main Street and First Street and was used to make the required embankments from Tustin Avenue to First Street. The balance of the roadway embankments were made from imported borrow material. The imported borrow was obtained from a site on the Irvine Ranch approximately five miles southeasterly from Browning Avenue. The borrow material consisted of a silty sand. It was loaded, by means of a loader, into trucks and trailer combinations, hauled to the job and compacted in place by a pneumatic-tired airport roller towed by a pneumatic-tired tractor. This compaction unit was able to operate at speeds of 10 to 20 miles per hour and satisfactory compaction results were consistently obtained. Major roadway excavation and embankment construction are now completed, frontage roads have been constructed, major structures are nearing completion and imported base and subbase materials have been placed on the main roadways. It is anticipated that cement-treated base and portland cement concrete paving operations will be completed by July 15th. It is estimated that all construction work will be completed and that this section of the Santa Ana Freeway will be in use before the end of this year.

The approximate construction cost for this contract is $2,000,000. Winston Brothers Company of Monrovia is the contractor, with Hugh S. Thompson as project manager, and Charles W. Goss as the job superintendent. G. C. Smith is the Bridge Department representative, with the writer as resident engineer for the State Division of Highways.

portion of the imported subbase material which is being obtained from a borrow pit on Orange County property adjacent to the highway. The imported subbase material is a uniform river sand and is being compacted by means of pneumatic-tired airport rollers towed by caterpillar tractors. By constant watering and rolling the sandy material is maintained in a firm and stable condition so that the DW-20s with carryalls are able to operate at high speeds over the roadway while hauling material.

Drainage Control

The alignment crossed a portion of an old Orange County cut and cover dump site just westerly of the Olive Undercrossing. Approximately 13,000 cubic yards of rubbish was removed from the roadway area and replaced with good material.

The drainage from the Route 175-43 (Santa Ana Canyon Freeway) intersection is concentrated by means of a system of pneumatic mortar lined ditches, corrugated metal pipes and reinforced concrete pipes into a centrally located 54-inch reinforced concrete pipe and thence into the Santa Ana River channel. Drainage across the freeway on the northerly side of the Santa Ana River is provided by means of a series of reinforced concrete box culverts at various locations. The freeway traverses an old flood plain of the Santa Ana River and "old timers" in the area tell of seeing several feet of water over the fields adjacent to the highway. It is believed that recent flood control work upstream on the river has minimized the possibility of this being repeated. Approximately 8,000 linear feet of reinforced concrete and corrugated metal pipes of various sizes in addition to 1,740 linear feet of reinforced concrete box were required to provide for drainage needs.

Drainage pumping facilities are being constructed for the depressed section of the North Olive Underpass, which is about 12 feet below the bed of the Santa Ana River.

The depressed section of the westbound lane of Route 43 is drained through the 54-inch gravity pipe line northerly to the river.

Project 50 Percent Complete

The Santa Ana Valley Irrigation Company's canal paralleled the westbound roadway of Route 43 on the north. Approximately 1,600 feet of this open channel was replaced with a 78-inch reinforced concrete pipe. Double rubber gasket joints were used in order to prevent any leakage into the depressed section of the westbound roadway on Route 43.

Construction operations are approximately 50 percent complete at this time. It is estimated that all work will be completed and the freeway will be opened for public use before the end of the year.

The estimated cost of this section of the freeway is approximately $1,100,000. B. J. Ukropina, Tom Polich, Steve Kral and John R. Ukropina are the contractors with George Ban as job superintendent. Don Keller is the Bridge Department representative, and the writer is the resident engineer for the State Division of Highways.

Harbor Freeway

Construction in the Wilmington-San Pedro Area

By F. E. STURGEON, Resident Engineer

One of the most important freeways being developed by the State Division of Highways in the Los Angeles area is the Harbor Freeway. This freeway extends for 22.8 miles from the four-level traffic interchange structure near the Los Angeles Civic Center to Battery Street in the harbor area of Wilmington and San Pedro. A total of 18 major construction projects have been awarded on this freeway by the State, 17 of which are for construction at the northerly end of this freeway project.

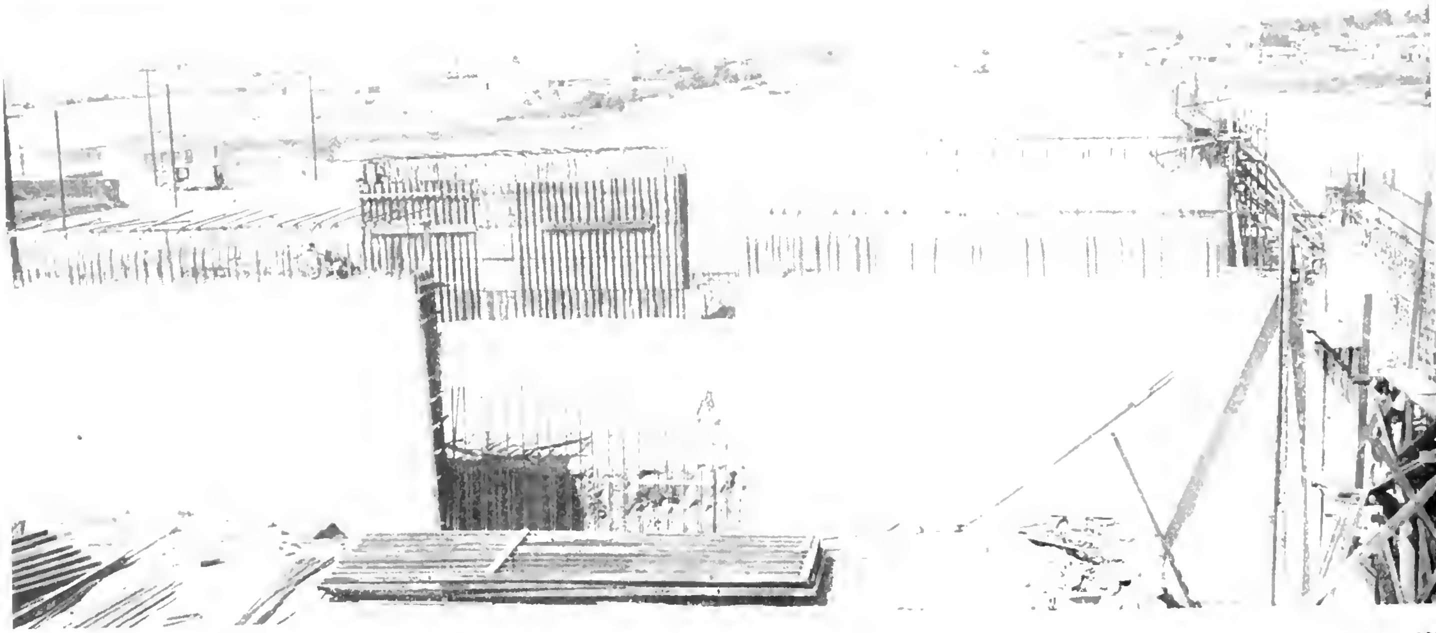
On July 22, 1954, work was started at the southerly end on a 2.8-mile section of the Harbor Freeway in the City of Los Angeles between Battery Street, San Pedro, and 0.2 mile north of Pacific Coast Highway in Wilmington. This contract was awarded to Vinnell Company, Inc. and Vinnell Constructors of Alhambra under a joint venture. Bid price was $3,077,969.90 and provided for full freeway construction complete with on- and off-ramps and frontage roads.

Eight Bridges

Included in the contract were eight reinforced concrete bridges, three pedestrian undercrossings, and three retaining walls. Also included was a storm drain system ranging in size from double 7-feet x 7-feet reinforced concrete boxes to 24-inch reinforced concrete pipes. Other items of work consisted of a myriad of minor contract items such as fencing, guard railing, curbs, highway lighting systems, illuminated sign systems, communication and signal systems, and traffic signal systems.

At this writing the work is 60 percent complete. All public utilities have been relocated, and private facilities of oil companies are 90 percent relocated. Frontage roads have been

Close up view of contractor's haul road through Union Oil refineries area, showing bottom-dump semitrailer that attains maximum speed of 50 miles per hour



UPPER General view of excavation area showing loader dumping into 22.7 cubicyards-capacity bottom-dump semitrailer. Excavation from this cut totals 1,200,000 cubic yards. LOWER Looking north at Anaheim Street Undercrossing under construction. Residential portion of Wilmington shown in right background. Harbor Junior College in left background.

Aerial view looking southerly at excavation area and haul road through oil refinery. At left is Wilmington-San Pedro Road. Traffic artery shown in background is Gaffey Street extending into San Pedro.

onstructed and traffic detoured hereon. Grading and bridge construction on the freeway section is progressing at a rapid rate.

Grading operations are worthy of pecial note. A profile of the project hows a maximum 85-foot cut at the outherly end of the job approximately 3,000 feet in length, having a otal of 1,200,000 cubic yards. The reeway is carried the remaining distance on embankment, bridging C treet, E Street, Anaheim Street and acific Coast Highway.

The bid price for excavation is).29 per cubic yard. Overhaul is).10 per mile yard with a 1,000-foot free haul. For this earth-moving job, the contractor moved in a fleet of 13 special built 22.7-cubic-yard water level capacity bottom dump semitrailers. These "wagons," as they are commonly called, and varying in number from 7 to 13 depending on length of haul, are moving an average 7,500 cubic yards per eight-hour day. Other equipment working in conjunction includes six D-8's, a heavy ripper, two sheepsfoot roller units, three 3,000-gallon sprinkler trucks, one 75-ton rubber-tired compactor, and two blades. Relative compaction tests average 94 percent.

Additional information on the wagons as supplied by H. J. Yount, Vice President of Vinnell Company and project manager, is as follows: The trailer is 35 feet long and trailer plus tractor is 48 feet long. Maximum width is eight feet. The trailer's load is carried on eight pairs of truck tires. The trailer axles have full air brakes with foot and hand controls in the cab. Weight of tractor and trailer empty is 28,800 lbs. Maximum road speed is 50 miles per hour. The opening and the closing by compressed air of the bottom dump gates is controlled by the driver in the cab. Then the entire load of 25 cubic yards can

. . . Continued on page 63

State Highway Contracts Awarded

MAY, 1955

Del Norte County—US 101—Between one mile north of Wilson Creek and 2.4 miles north of Gasquet (portions) surface with plant mixed surfacing. 15.2 miles. Contract awarded to Peter Kiewit Sons' Co., Medford, Oregon, $99,613.70.

Humboldt County—US 101—Between one mile south of Phillipsville and two miles south of Pepperwood, at various locations. Install new drainage facilities and pave existing culvert inverts. Contract awarded to Melvin W. Oldham & Harold P. Hastings, Lakeport, $13,447.

Humboldt County—FAS 1204—About 11.5 miles southeast of Bridgeville at Martin Creek. Construct a steel beam span bridge with reinforced concrete deck and construct a graded roadbed and surface with selected material. Contract awarded to R. H. Douglas, Fortuna, $44,736.

Mendocino County—SR 128—Between 8.7 miles and 15 miles east of Boonville. Scarify and reshape the existing roadbed, construct cement treated base, place plant-mixed surfacing, install guide posts and culverts. 6.3 miles. Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $174,113.

Mendocino County—SR 1—Between 0.6 mile south and 0.2 mile north of Greenwood Creek, at Elk. Construct a graded roadbed and place surfacing, construct a reinforced concrete bridge, completion of which provides a bridge across Greenwood Creek and approaches, all on new alignment. 0.9 mile. Contract awarded to Granite Construction Co., Watsonville, $367,269.

Mendocino County—SR 1—Across Salmon Creek, about 0.6 mile south of Albion. Clean and paint the existing bridge. Contract awarded to Robert A. Thompson & Chas. B. Murphy, San Francisco, $36,402.

Mendocino County—SR 1—Across Albion River and Navarro River, between 18 and 22 miles south of Fort Bragg. Clean and paint two steel bridges. Contract awarded to George C. Punton, San Diego, $14,943.

Shasta County—US 299—Between Montgomery Creek and 0.2 mile east of Hillcrest, approximately 35 miles northeasterly of Redding. 3.6 miles. Grade and surface with plant-mixed surfacing on cement treated base and untreated base, completion of which provides a two-lane highway and frontage roadway on new alignment, eliminating many sharp curves. Contract awarded to Eaton and Smith, San Francisco, $601,031.80.

Trinity County—FAS 1089—Between 1.9 miles east of Costa Ranch and Buckeye Creek Road. Construct a graded roadbed and install drainage facilities. 3.3 miles. Contract awarded to Souza & McCue Construction Co., Inc., Yuba City, $94,674.

Butte County—SR 87—Across Dudley Creek, Gold Run Creek and Dry Creek Overflow, about four to ten miles northerly of the City of Oroville. Construct three reinforced concrete bridges and grade and surface approaches. Contract awarded to Thomas Construction Co., Fresno, $42,727.

Butte County—FAS 757—Between Neal Road and Wagstaff Road, on Skyway in and near Paradise. Construct a graded roadbed, place cement treated base and plant mixed surfacing. 2.8 miles. Contract awarded to W. H. Darrough & Sons, Yuba City, $205,668.

El Dorado County—US 50—Between near west city limits of Placerville and 0.2 mile east of Washington Street Overhead. Grade roadbed and place surfacing and bases and construct channelization, connections and approaches. 1.5 miles. Contract awarded to Harms Bros., Sacramento, $368,157.25.

El Dorado County—US 50—SR 93—Adjacent to Placerville, and between 1.2 miles east of Camino and two miles east of Sportsman's Hall, at three locations. Place plant mixed surfacing over the existing surfacing. 10.2 miles. Contract awarded to Harms Brothers, Sacramento, $72,935.

Glenn County—US 99—Between 0.3 mile south of Willows and Tehama County Line. Widen the existing roadbed, place imported borrow, surface with plant-mixed surfacing on cement treated base and untreated base. 7.8 miles. Contract awarded to Baun Construction Co., Inc., Fresno, $152,381.25.

Nevada and Placer Counties—US 40 and SR 28—At six locations, near Truckee and Tahoe City. Place plant-mixed surfacing over the existing surfacing and on cement treated base and apply seal coats, 13.9 miles. Contract awarded to Gill Construction Co., Bakersfield, $215,110.

In Sierra, Nevada, Placer, Colusa and Yolo Counties—at various locations—Paint or surface treat the exteriors of buildings. Contract awarded to Fay L. Roberts, Susanville, $3,795.

Sutter and Butte Counties—Near Yuba City and Oroville, at three locations. Place plant-mixed surfacing on existing surfacing and apply seal coat at one location, widen the existing road and place plant-mixed surfacing on cement treated base and untreated base at another location, and place plant-mixed surfacing on existing surfacing and apply seal coat at the third location. 9.6 miles. Contract awarded to Baldwin Contracting Company, Inc., Marysville, $154,909.41

Sutter County—SR 20—Between Meridian and Sutter Causeway. Place plant-mixed surfacing over existing pavement, construct untreated base shoulders and apply seal coats. 3.2 miles. Contract awarded to Baldwin Contracting Company, Inc., Marysville $48,057.23.

Sutter County—Alt. US 40—Across Sutter By-Pass, about five miles southwest of Tudor. Repair the existing bridge. Contract awarded to Pacific Bridge Company, San Francisco, $54,896.

Sutter County—FAS 926 and 1168—Between one mile south of Striplin Road and Nicolaus Avenue, on El Centro Boulevard. Widen the existing shoulders and place plant-mixed surfacing. 4.0 miles. Contract awarded to Granite Construction Co., Watsonville, $72,301.

Yolo County—SR 99—Between Solano County Line and 5.5 miles south of West Sacramento. Place imported subbase material and untreated base and apply a prime coat and double seal coat. 10.4 miles. Contract awarded to Asta Construction Co., Rio Vista, $234,401.

Alameda County—At the Hayward Maintenance Station. Construct a metal building and reroof an existing building. Contract awarded to Walter H. Gunn, Castro Valley, $7,993.

Alameda County—US 50—About one mile northwest of Livermore, at Arroyo Las Positas. Construct concrete aprons and wingwalls, construct fences at and near the concrete box culverts. Contract awarded to O. C. Jones & Son, Berkeley, $2,601.25.

Contra Costa County—Between Summit and Diablo State Park Highway. Apply a medium seal coat to the existing bituminous surfacing, place plant-mixed surfacing on portions of the roadbed and reshape roadside gutters. 11.5 miles. Contract awarded to O. C. Jones & Sons, Berkeley, $23,-001.50.

Santa Clara County—SR 42—Across Saratoga Creek, about 1.2 miles and 1.1 miles west of Saratoga. Repair two bridges. Contract awarded to Bridges Construction Co., San Jose, $7,343.94.

Santa Clara County—SR 9—Between Route 2 and Beemer Avenue, on Mathilda Avenue, 0.9 mile. Construct a graded roadbed and surface with plant-mixed surfacing on cement treated base. Contract awarded to Granite Construction Company, Watsonville, $112,559.85.

Santa Clara County—FAS 1015—Between Highwood Drive and Story Road, on Capitol Avenue. Widen the existing bridge and grade approaches, place plant mixed surfacing on untreated base, and apply seal coats. Contract awarded to Lew Jones Const. Co., San Jose, $31,781.35.

San Francisco—US 101—Over the Presidio of San Francisco and on the Marina Viaduct. Clean and paint an existing bridge and an existing steel stairway. Contract awarded to D. Zelinsky & Sons, San Francisco, $53,214.

San Mateo and Santa Clara Counties—US 101—Between 0.1 mile north of San Mateo-Santa Clara County Line and 0.1 mile north of University Avenue. 0.5 mile. Construct a graded roadbed, widen the existing traveled way, place plant-mixed surfacing over the existing pavement and on cement treated base, widen the existing bridge and construct channelization, connections and approaches. Contract awarded to L. C. Smith Co., San Mateo, $172,137.10.

Sonoma County—US 101—At the intersection of Redwood Highway with East Fulton Road and with Fulton Road near Windsor. Install complete in place, a flashing beacon and highway lighting system. Contract awarded to Fred Esselink Electric Co., Sebastopol, $3,660.

San Luis Obispo County—SR 137 and 125—Across Salinas River, 15 and 20 miles, respectively, north of San Luis Obispo. Clean and paint two bridges. Contract awarded to Howard E. Clark, San Luis Obispo, $9,393.

San Luis Obispo County—FAS 1207—Between 1.7 and 2.1 miles northeast of Cayucos, on Old Creek Road. Construct a graded roadbed and a steel bridge. Contract awarded to P. J. Zuiderweg, San Luis Obispo, $37,417.50.

Fresno County—SR 180—Between Derrick Avenue and Belmont Avenue. Construct a graded roadway and surface with road-mixed surfacing. 1.1 miles. Contract awarded to L. B. Wells Construction Co., Visalia, $24,480.

Kern County—SR 178—At Bowerbank Siding about 22 miles west of Bakersfield. 0.9 mile. Construct a graded roadbed and surface with plant-mixed surfacing on cement treated base. Contract awarded to Dicco Inc., Bakersfield, $45,939.

Kern County—FAS 884—Between Di Giorgio Road and White Wolf Road, on Comanche Drive, 2.8 miles. Construct a graded roadbed, surface with plant-mixed surfacing on cement treated base, construct road-mixed surfacing on shoulders and remove and salvage a timber bridge. Contract awarded to Griffith Company, Los Angeles, $91,804.

Los Angeles County—US 101—Between Grand Avenue and Spring Street. Construct channelization and install and modify highway lighting and illuminated sign systems. Contract awarded to C. O. Sparks, Inc. and Mundo Engineering Co., Los Angeles, $27,671.

Los Angeles County—US Alt. 101—Across Dominguez Channel, about nine miles north of Orange County Line. Clean and paint an existing bridge. Contract awarded to Acme Maint. Engr. Co., Montebello, $13,130.

Los Angeles County—Between Rosecrans Avenue and Orange County Line, on Santa Ana Freeway. Install complete in place, highway lighting and illuminated sign systems. Contract awarded to E. Seymour, Long Beach, $27,725.

Los Angeles County—SR 175—At the intersections of Artesia Avenue with Downey Avenue, Clark Avenue, Bellflower Boulevard and Woodruff Avenue. Install and modify the traffic signal systems and highway lighting. Contract awarded to Electric & Machinery Service, Inc., South Gate, $12,872.

Los Angeles County—SR 178—Between San Gabriel River and the Orange County Line, on Carson Street. Construct a graded roadbed and place plant mixed surfacing on untreated base and modify the existing traffic signal systems and highway lighting systems. 1.7 miles. Contract awarded to N. L. Basich, Garvey, $368,828.25.

Santa Barbara and Ventura Counties—SR 15 and US 399—Clean and paint three steel bridges and three tunnels. Contract awarded to J. P. Carroll Company, Los Angeles, $6,972.

Merced County—US 99—Between 0.5 mile and 2.7 miles north of Livingston Underpass. Install, complete in place, two scale houses, with truck scales and weightographs. Contract awarded to J. L. Webster, Galt, $34,863.

Tuolumne County—SR 120—Between 0.5 mile east of Chinese Camp and Woods Creek. Construct a graded roadbed and surface with plant-mixed surfacing on untreated base on new alignment, eliminating many curves. 1.9 miles. Contract awarded to O. K. Mittry and Sons, Gardena, $287,912.60.

San Diego County—US 80—At Del Cerro Avenue Connection, on Alvarado Canyon Road. Grade and widen the existing roadbed, and grade and surface the connecting road with plant-mixed surfacing and untreated base. 0.9 mile. Contract awarded to Einer Brothers Inc., Escondido, $16,206.80.

San Diego County—US 80—Between Lytton Street and Pacific Highway, in the City of San Diego (portions). Place plant-mixed surfacing, on existing roadway shoulders. 1.4 mile. Contract awarded to V. R. Dennis Construction Co., San Diego, $1,890.60.

San Diego County—US 395—At Cambridge Street. Construct a pedestrian undercrossing. Contract awarded to N. M. Saliba Co., Gardena, $19,-567.

JUNE, 1954, AWARDS

Del Norte County—US 101—Two miles east of Myrtle Creek, remove an existing embankment, construct two log cribs and restore the embankment to its original grade. Contract awarded to Paul E. Woof, Fresno, $26,790.

Del Norte County—FAS 985—Across Middle Fork of Smith River, about 11 miles northeast of Crescent City, construct a bridge. Contract awarded to G. M. Carr Co. and Bati Rocca, Santa Rosa, $88,791.

Humboldt County—US 101—Between Seventh Street and 0.2 mile north of Arlington Way. Pave island and median areas with Portland cement concrete, prepare and plant roadside areas, and install a chain link fence. 1.4 miles. Contract awarded to Watkin & Sibbald, San Anselmo, $34,837.10.

Humboldt County—US 101—Between the south city limits of Eureka and 0.5 mile north of the north city limits of Eureka. Construct a reinforced concrete bridge, widen portions of the existing roadbed, construct sections of a graded roadbed and intersection channnelization and surface with plant-mixed surfacing on cement treated base and untreated base. 2.5 miles. Contract awarded to Ben C. Gerwick Inc., San Francisco, $842,406.

Humboldt County—US 101 and US 299—Between Weott and 0.5 mile south of Freshwater Summit, and between three miles west and 13 miles east of Blue Lake (portions). Place plant-mixed surfacing and construct a passing lane. 21.4 miles. Contract awarded to Mercer, Fraser Company, Inc. and Mercer, Fraser Gas Co., Inc., Eureka, $156,447.50.

Lake County—SR 29—Across Long Valley Creek and at Guenoc cattlepass, about one and two miles respectively, north of Middletown. Replace an existing timber cattlepass with a reinforced concrete cattlepass, and construct a reinforced concrete slab bridge. Contract awarded to E. H. Thomas Co., Las Vegas, Nevada, $18,713.

Mendocino County—US 101—Between 0.2 mile north of Sonoma County line and 0.5 mile south of Lanes Flat (portions). Place plant-mixed surfacing, repair a slipout and construct passing lanes. 1.4 miles. Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $227,000.

Trinity County—US 299—Between one mile east of Trinity River Bridge and Prairie Creek. Place road-mixed surfacing over the existing base and apply seal coat. 7.4 miles. Contract awarded to Mercer, Fraser Co., Inc. and Mercer, Fraser Gas Co., Inc., Eureka, $59,490.

Lassen and Plumas Counties—US 395 and US Rt. 40—Between Doyle and 15.4 miles south and between 1.2 miles west of Portola and 0.4 mile east of Lassen County line. Surface with plant-mixed surfacing. 33.2 miles. Contract awarded to Bell Construction Co., Reno, Nevada, $185,708.50.

Modoc County—FAS 1215—Between Lookout and two miles east. Construct six reinforced concrete bridges, three across Pit River Slough, one across Mamoth Slough and two across Roberts Slough. Contract awarded to E. H. Thomas Co., Sacramento, $63,820.

Shasta County—US 299—Between Burney and Fall River Mills. Apply asphaltic emulsion paint binder and surface with plant-mixed surfacing on existing surfacing. 17.2 miles. Contract awarded to Clements Construction Co., Centerville, $118,390.

Siskiyou County—US 99 and US 97—Between 0.8 mile north of Shasta County line and Camp Lowe; and between Weed and 8.3 miles north. Surface with plant mixed surfacing on untreated base and existing pavement; and construct a graded roadbed and surface with plant mixed surfacing on cement treated base and existing pavement. 25.2 miles. Contract awarded to Peter Kiewit Sons Co., Medford, Oregon, $272,979.

Siskiyou County—FAS 1089—Between Fort Jones and Quartz Valley Road. Scarify and reshape existing roadbed, apply a prime coat and surface with plant-mixed surfacing. 6.8 miles. Contract awarded to Wm. S. & Bruce F. Rogers Co., Madera, $85,285.

Tehama County—FAS 1081—Between Lanes Valley Road and Manton. Place plant mixed surfacing on cement treated base and on existing base materials, construct shoulders of untreated base, place plant-mixed surfacing dikes and apply seal coat. 7.2 miles. Contract awarded to Fredrickson & Watson Construction Co., Oakland, $105,305.55.

Trinity County—US 299—Between Vitzthum's and one mile east of Tom Lang Gulch. Construct a graded roadbead, place imported subbase material and place plant-mixed surfacing on cement treated base, completion of which provides a roadway on new alignment eliminating many curves. 3.0 miles. Contract awarded to Earl L. McNutt Co., Eugene, Oregon, $586,134.20.

Colusa County—SR 45—Between 4.4 miles north of Yolo County line and 1.7 miles north of Wilkins Slough (portions). Place untreated base on imported subbase material and road-mix the upper portion. 3.8 miles. Contract awarded to W. H. O'Hair Company, Colusa, $112,830.

El Dorado County—US 50—At Echo Summit Maintenance Station. Construct an extension to the existing building and partitions in portions. Contract awarded to Richard W. Porter, Yuba City, $15,605.

Glenn County—SR 45—Between 4.7 miles north of Glenn and Hamilton City (portions). Construct a graded roadbed, approaches and connections and place surfacing and base. 9.5 miles. Contract awarded to Ace Excavators, San Leandro, $237,-295.25.

Placer County—SR 89—At the Tahoe City Maintenance Station. Import fill material, grade, install a culvert pipe, place road-mixed surfacing, construct concrete sidewalks, install chain link fence and furnish and install two gates. Contract awarded to Floyd O. Bailey, Auburn, $11,154.

Placer, Yuba, and Nevada Counties—At four locations. Place plant-mixed surfacing over the existing surfacing. 11.3 miles. Contract awarded to Brown-Ely Co., Contractors, Yuba City, $79,968.53.

Sacramento County—At the Headquarters Laboratory Site, at 59th Street and Folsom Boulevard, in the City of Sacramento. Relocate existing utility lines, grade an unsurfaced area, grade and surface a hardstand area, install a storm and sanitary sewer system, stockpile and replace some existing base and bituminous surfacing, and place untreated base, plant-mixed surfacing and fog seal. Contract awarded to Brighton Sand & Gravel Co., Perkins, $22,627.25.

Sierra County—SR 49 and 89—Between Bassetts and 2.1 miles easterly and between Sattley and Calpine. Place plant-mixed surfacing over untreated base. 4.2 miles. Contract awarded to Brown Ely Co., Contractors, Yuba City, $144,181.65.

Yolo and Colusa Counties—At three locations. Place plant-mixed surfacing over the existing surfacing. 16.7 miles. Contract awarded to Granite Construction Co., Watsonville, $98,873.20.

Yuba County—At the Marysville Maintenance Station. Construct a sign storage building and a sign storage shelter. Contract awarded to Coursey Construction Co., Yuba City, $19,090.

Alameda County—At the Administration Building, Toll Plaza, San Francisco-Oakland Bay Bridge. Rebuild the fireboxes of two boilers and replace burners and boiler controls. Contract awarded to Service Heat and Power Co., Oakland, $4,468.30.

Alameda County—At the intersections of Foothill Boulevard with Bridge Street and East 14th Street with Bridge Street and Grove Way. Install traffic signal systems and highway lighting and construct channelization. Contract awarded to Abbett Electric Corp., San Francisco, $30,863.

Alameda County—At the Fruitvale Avenue Maintenance Station. Construct a prefabricated metal building. Contract awarded to Walter H. Gunn, Castro Valley, $6,294.

Alameda County—At the intersections of East 14th Street with 150th Avenue and with 148th Avenue; of Jackson Street with Hesperian Boulevard; and Foothill Boulevard with Miramar Avenue. Construct channelization, install and modify traffic signal systems and highway lighting. Contract awarded to Engineering Design Corp., Berkeley, $27,022.75.

Alameda County—At Lincoln Avenue Extension. Construct a graded roadbed and place plant mixed surfacing on untreated base and construct a reinforced concrete bridge. 0.1 mile. Contract awarded to Stolte Inc., Gallagher & Burk, Inc., Oakland, $121,406.60.

Alameda and Contra Costa Counties—At various locations. Place plant-mixed surfacing over the existing pavement and cement treated base. 8.2 miles. Contract awarded to Lee J. Immel, San Pablo, $58,188.25.

Contra Costa County—SR 21—Between Danville and 0.1 mile north of Newell Avenue. Grade and widen the existing roadbed with plant mixed surfacing on untreated base and cement treated base, and place plant-mixed surfacing on the existing pavement. 4.0 miles. Contract awarded to Gallagher & Burk, Inc., Oakland, $244,071.94.

Marin County—US 101—Between Waldo and 0.3 mile north of Alto. Grade and surface with plant-mixed surfacing on cement treated base, construct a welded plate girder bridge, and install highway lighting and illuminated sign system, completion of which provides a six-lane divided highway, together with road connection ramps and frontage roads. 1.9 miles. Contract awarded to Dan Caputo Co., Dan Caputo & Edw. Keeble, San Jose, $1,156,675.50.

Marin, Sonoma, and Napa Counties—At various locations. Place plant-mixed surfacing over the existing pavement. 21.8 miles. Contract awarded to Reichhold & Jurkovish and Lee J. Immel, San Pablo, $146,275.95.

Napa County—FAS 824—Across Napa River near northerly city limits of Napa. Construct a reinforced concrete bridge. Contract awarded to Lord & Bishop Inc. & Alvin O. Erickson Co., Napa, $183,314.

Santa Cruz County—FAS 1146—On Freedom Boulevard, between the Monument and the Town of Freedom. Construct a graded roadbed, place imported subbase material and untreated base, surface with plant-mixed surfacing and apply seal coats. 0.6 mile. Contract awarded to Edward Keeble, San Jose, $49,921.

San Francisco County—Between Fulton Street and Lake Street, on Park Presidio Boulevard. Widen the existing roadbed and place plant mixed surfacing on concrete base and relocate and modify the existing traffic signal systems, completion of which will provide a six-lane divided highway. 1.0 mile. Contract awarded to The Fay Improvement Co., San Francisco, $153,902.40.

San Francisco City and County—Between 18th Street and Bryant Street at 9th and 10th Street connections. Revise the existing deck drains and construct two new deck drains. Contract awarded to Adam Arras and Son, San Francisco, $1,129.40.

San Francisco—At the District IV Office. Clean and paint the district office and garage. Contract awarded to Dave Russ, San Francisco, $2,434.

San Mateo County—SR 5—Between 0.2 mile south Junction Route 56 at Thornton and south city limits of San Francisco Sign Route 1. Construct a graded roadbed and surface with plant mixed surfacing on untreated base, construct reinforced concrete extensions to an existing pedestrian undercrossing, construct a new reinforced concrete pedestrian undercrossing, install traffic signal and highway lighting systems, construct channelization, connections and approaches. 0.9 mile. Contract awarded to Chas. L. Harney, Inc., San Francisco, $322,850.55.

San Mateo County—At the Burlingame Maintenance Station. Join two existing metal buildings by erecting foundation, front and rear metal walls and roof over an existing 10 foot by 14 foot space including the placement of Portland cement concrete floor, heating, electrical and sanitary facilities. Contract awarded to Stevenson Pacific, Redwood City, $3,889.

San Mateo, Santa Clara, and Santa Cruz Counties—At various locations. Place plant-mixed surfacing over the existing pavement. 21.3 miles. Contract awarded to L. C. Smith Co., San Mateo, $129,315.50.

Sonoma County—SR 104—Between south city limits of Sebastopol and 0.1 mile west of Route 1. Widen the existing roadbed on portions of the project, construct a graded roadbed on a portion and place plant-mixed surfacing on the existing pavement and on cement treated base. 3.7 miles. Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $226,798.

Sonoma County—At the Petaluma Maintenance Station, about ½ mile south of the City of Petaluma. Construct a prefabricated metal building. Contract awarded to Walter H. Gunn, Castro Valley, $6,983.

Santa Barbara County—US 101—Between 0.5 miles west of Arroyo Hondo and Gaviota. Construct graded roadbeds with approach roads, ramps and highway connections, and place Portland cement concrete pavement on bituminous treated subgrade and plant mixed surfacing on cement treated base, completion of which provides a four-lane divided highway. 3.7 miles. Contract awarded to Frederickson & Watson Construction Co., Oakland, $786,666.66.

San Benito and Monterey Counties—US 101—At various locations. Place plant-mixed surfacing over existing pavements. 10.5 miles. Contract awarded to Granite Construction Co., Watsonville, $64,525.

San Luis Obispo County—US 101—Between Russell Turn and Arroyo Grande. Construct a graded roadbead and pave with Portland cement concrete on cement treated subgrade and plant mixed surfacing on cement treated base, construct a reinforced concrete bridge and widen an existing bridge, completion of which provides a four lane divided highway with approach roads, ramps and connections. 4.6 miles. Contract awarded to Madonna Construction Co., San Luis Obispo, $919,930.

San Luis Obispo County—SR 125—Between five miles east of Route 56 and San Gabriel Avenue. Place plant mixed surfacing on cement treated base and existing surfacing. 7.9 miles. Contract awarded to Valley Paving and Construction Co., Inc., Pismo Beach, $52,786.50.

San Luis Obispo County—At California State Polytechnic College. Place road mixed surfacing on the existing roads and parking areas, construct a graded roadbed and surface with plant mixed surfacing and Portland cement concrete pavement on untreated base, and construct reinforced concrete structures. Contract awarded to C. E. Ruberts & Son, Coalinga, $34,835.

San Luis Obispo County—At various locations. Place plant mixed surfacing over the existing pavements. 18.4 miles. Contract awarded to Valley Paving & Const. Co., Inc., Pismo Beach, $72,386.50.

Fresno County—US 99—Between San Joaquin Street in the City of Fresno and West Street. Grade and pave with concrete pavement on cement treated subgrade and construct six bridges, four of reinforced concrete, and two of steel, and construct two pumping plants, completion of which provides a four lane divided highway with bridges at El Dorado Street Overcrossing, Tehama Street Overcrossing, Newlsen Avenue Undercrossing, Pacific Avenue Overcrossing, Kerman Branch Underpass, Belmont Avenue Overcrossing and pumping plants at Tehama Street Overcrossing and at Kerman Branch Underpass. 1.8 miles. Contract awarded to Gene Richards, Inc., D. M. Underdown, Gene Richards, Fresno, $1,253,555.86.

Fresno County—SR 180—On B Street between White's Bridge Avenue and Fresno Street. Surface with plant mixed surfacing on the existing pavement and on cement treated base on the existing shoulders. 0.6 mile. Contract awarded to Gene Richards, Inc., Fresno, $16,315.50.

Fresno and Madera Counties—SR 180 and 41, and US 99—At various locations. Place plant mixed surfacing on existing surfacing. 23.2 miles. Contract awarded to Stewart and Nuss, Inc., Fresno, $116,067.50.

Kern County—At various locations. Place plant-mixed surfacing over the existing surfacing. 30.9 miles. Contract awarded to Dicco, Inc., Bakersfield, $155,876.

Kern County—SR 178—Between three miles west and one mile west of Democrat Springs. Widen portions of existing roadbed and place road-mixed surfacing. 2.3 miles. Contract awarded to Dicco, Inc., Bakersfield, $119,681.50.

Kern County—SR 178—At Bodfish Maintenance Station. Erect a prefabricated metal truck shelter, metal gas and oil house, concrete fuel pump island, prefabricated pump house, and surface a portion of the yard. Contract awarded to Rand Construction Co., Bakersfield, $21,976.50.

Kern County—SR 141—In and adjacent to the City of Bakersfield, at the intersection of Route 141 with H Street. Install traffic signal system and highway lighting. Contract awarded to McCrory Electric Co., Fresno, $8,570.

Kern County—SR 143—Between Di Giorgio Road and Panama Road. Construct a graded roadbed and place plant-mixed surfacing on cement treated base. 1.1 miles. Contract awarded to Griffith Company, Los Angeles, $147,759.40.

Tulare County—US 99—Between 0.5 mile north of Earlimart and 0.5 mile north of Pixley. Completion of this contract will provide a four-lane divided highway, constructed of graded roadbeds, paved with Portland cement concrete on cement treated subgrade, graded frontage roads, ramps and connecting roads and surfaced with plant mixed surfacing on cement treated base, together with five reinforced concrete bridges at Deer Creek, at Avenue 76 Undercrossing, at Avenue 96 Overcrossing, at D Street Overcrossing and at Avenue 100 Overcrossing. 5.8 miles. Contract awarded to Gordon H. Ball, Danville, $1,521,676.20.

Tulare County—US 99—Between Tulare Airport and Tagus. Plant shrubs and trees. 8.0 miles. Contract awarded to Olivers Flowers Shop and Nursery, Fresno, $17,031.75.

Tulare County—At various locations. Place plant-mixed surfacing on existing surfacing. 47.0 miles. Contract awarded to Griffith Company, Los Angeles, $209,683.50.

Los Angeles County—On US 101, in the City of Los Angeles—Between Barham Boulevard and Mulholland Drive. Place plant mixed surfacing over shoulder areas and construct drainage facilities. 0.5 mile. Contract awarded to Schroeder & Co., Sun Valley, $26,861.50.

Los Angeles County—At various locations, in the Cities of Los Angeles and Glendale. Place plant mixed surfacing on the existing pavement and surfacing. 8.5 miles. Contract awarded to Schroeder & Co., Sun Valley, $74,228.

Los Angeles County—At various locations, in and near the City of Los Angeles. Construct alterations at six pumping plants. Contract awarded to Walker and Murphy, North Hollywood, $5,182.50.

Los Angeles County—SR 19—Between Pearl Street in Pomona and Foothill Boulevard. Widen the existing street roadway and place plant mixed surfacing on untreated base and over portions of existing plant mixed surfacing and modify traffic signals and roadway lighting systems, completion of which provides four lanes for through traffic and two lanes for parking. 2.8 miles. Contract awarded to M. S. Mecham & Sons, South Gate, $473,234.50.

Los Angeles County—US Alt. 101—Across Alamitos Bay. Repair the existing bridge. Contract awarded to Johnson Western Constructors, San Pedro, $11,880.

Los Angeles County—US Alt. 101 and SR 107—Between California Street in Santa Monica and West Channel Road in Los Angeles, and between 137th Street and Broadway in Hawthorne. Surface with plant-mixed surfacing. 1.8 miles. Contract awarded to Schroeder & Co., Sun Valley, $20,496.24.

Los Angeles County—SR 19 and 35—At various locations. Place plant-mixed surfacing on the existing pavement. 4.8 miles. Contract awarded to Warren Southwest Inc., Torrance, $27,604.

Los Angeles County—SR 35—Between Pioneer Boulevard and San Jose Creek, about 0.8 mile north of the north city limits of Whittier. Construct shoulder areas and realign portions of an existing highway by grading, placing imported subbase material, placing plant-mixed surfacing on untreated base and on existing pavement, and applying seal coats. 1.4 miles. Contract awarded to Vido Kovacevich Company, Rosemead, $107,097.45.

Los Angeles and Ventura Counties—US 99 and US 101—At truck weighing stations near Castaic and near Montalvo. Install signal systems, lighting and portions of water system. Contract awarded to Oldfield Electric Co., Ventura, $7,876.50.

Orange County—US 101 and SR 19—At various locations, on Route 2 between La Entrada Place and Central Avenue, and on Route 19, between Route 2 and Los Angeles County line. Place plant mixed surfacing on the existing pavement. 6.4 miles. Contract awarded to Sully-Miller Contracting Co., Orange, $35,528.50.

Orange County—SR 62—Between 0.2 mile south of Imperial Highway and Whittier Boulevard. Construct a graded roadbed and surface with plant mixed surfacing on untreated base, and remove an existing bridge, concrete curbs and structures. 1.8 miles. Contract awarded to Sully-Miller Contracting Co., Orange, $138,200.01.

Orange County—SR 171—At Stanton Maintenance Station, on Katella Avenue east of Huntington Beach Boulevard. Construct a truck shelter including utilities. Contract awarded to Precision Fabricators Inc., Paramount, $10,848.

Orange County—At various locations. Place plant-mixed surfacing on the existing pavement 14.2 miles. Contract awarded to Sully Miller Contracting Co., Orange, $54,882.80.

Ventura County—At various locations. Place plant-mixed surfacing on the existing pavement and surfacing. 10.6 miles. Contract awarded to Wester Motor Transfer Inc., Santa Barbara, $47,696.70.

Ventura County—At various locations. Surfac with plant-mixed surfacing. 8.5 miles. Contrac awarded to Baker & Pollock, Ventura, $33,250.

Ventura County—US 399—Between Route and 0.3 mile south of Mills School. Grade an surface with plant-mixed surfacing on untreate base, construct four reinforced concrete bridges Stanley Avenue Undercrossing, Shell Road Unde crossing, Pipe Line No. 3 Undercrossing, Pip Line No. 1 Undercrossing, and install highwa lighting and traffic signal systems, completion which provides a four lane divided highway to gether with a frontage road and on and off-ramp on new alignment. 4.1 miles. Contract awarded Guy F. Atkinson Company, Long Beach, $1,736 022.50.

Riverside County—FAS 700—Between Tyl Avenue and Van Buren Street, on Arlington Aveau Construct a graded roadbed, place plant mixed su facing on cement treated base and apply seal coat 1.4 miles. Contract awarded to Robert E. L. Park Co. and Lowe & Watson, Claremont, $112,039.7

Riverside and San Bernardino Counties—At var ous locations. Place plant-mixed surfacing over th existing surfacing. 33.3 miles. Contract awarded Matich Brothers, Colton, $252,183.70.

San Bernardino County—US 99—Between o mile west of Colton and the Santa Ana Rive Grade, place imported base material, constru cement treated subgrade and Portland cement co crete pavement, place plant mixed surfacing ov imported base material, cement treated base a existing pavements, construct eight bridges Rancho Avenue Off ramp Overcrossings, Thi Street Undercrossing, Colton Overhead, Nin

Street Overhead, Pavillion Spur Overhead, Route 31-26 Separation, Warm Creek Bridge, Warm Creek Overflow Bridge and a pumping plant, all of reinforced concrete construction, completion of which will provide a two graded four lane divided highway, together with on-ramps, off ramps, and road connections, on new alignment. 2.4 miles. Contract awarded to W. F. Maxwell & Hermreck and Easter, Los Angeles, $1,736,751.65.

San Bernardino County—US 66-395—Construct buildings and other improvements at Maintenance Station. 1.4 miles easterly from Baker. Contract awarded to Dill & Robinson, Banning, $59,937.10.

San Bernardino County—SR 18—Between Ralston Avenue and 40th Street, on Sierra Way. Surface the widened area with plant-mixed surfacing over the existing material and construct curbs, sidewalks and driveways. Contract awarded to R. A. Erwin, Colton, $5,043.75.

San Bernardino County—US 95—Between Aqueduct Road and 7.7 miles north of Pyramid Peak. Place road-mixed surfacing over the existing surfacing. 10.0 miles. Contract awarded to F. H. Harris, San Bernardino, $31,945.

San Bernardino County—SR 177—Between Orange County line and Pipe Line Avenue. Widen the existing traveled way and place plant-mixed surfacing on existing surfacing. 4.8 miles. Contract awarded to E. L. Yeager Co., Riverside, $57,457.50.

San Bernardino County—FAS 1199—On San Bernardino Avenue between Mulberry and Fontana Avenues. Construct graded roadbeds and place plant-mixed surfacing thereon and over existing pavement, apply seal coats. 2.3 miles. Contract awarded to George Herz & Company, San Bernardino, $123,807.90.

San Bernardino County—At the State Highway District Shop. Develop and plant grounds. Contract awarded to Charlton Nurseries, San Bernardino, $2,116.03.

Inyo County—SR 76—Between Otey's and Bishop. Construct a graded roadbed and surface with road-mixed surfacing on cement treated base and imported base material and widen three existing timber tresle bridges. 3.6 miles. Contract awarded to Thomas Construction Co., Fresno, $123,118.40.

Inyo and Kern Counties—At various locations. Place plant-mixed surfacing and road mixed surfacing over the existing surfacing. 17.5 miles. Contract awarded to N. L. Basich, Garvey, $145,870.

Kern County—US 6 and US 466—Between 0.8 mile north of Mojave and Boron. Construct a two-lane highway by grading, placing imported borrow, plant-mixed surfacing, on untreated base and applying a seat coat. 21.7 miles. Contract awarded to Harms Bros., Sacramento, $552,712.50.

Mono County—US 395—At the Crestview Maintenance Station about 48 miles north of Bishop. Construct an extension to an existing building. Contract awarded to D. L. Nicoll, Mammoth Lakes, $2,182.53.

Mono County—US 395—Between Route 95 and Alpine County line. Revise drainage facilities and apply fog seal coat. 7.6 miles. Contract awarded to J. Henry Harris, Berkeley, $31,553.10.

Mono County—At various locations. Place road mixed surfacing over the existing surfacing. 13.8 miles. Contract awarded to J. Henry Harris, Berkeley, $69,465.

Mono County—SR 40—Between 10.3 miles east of Route 23 and Nevada State Line; about 17 miles southwesterly of the town of Lee Vining. 11.0 miles. Grade and apply penetration treatment to untreated base. Contract awarded to Payne Construction Co. and Marchio, Baker, Trewhitt Co., Inc., Oakland, $176,938.

Mono County—FAS 1093—From 5.5 miles to 13.6 miles southwest of Bridgeport. Construct a graded roadbed and surface with road-mixed surfacing on imported base material. 8.1 miles. Contract awarded to Payne Construction Co. and Marchio, Baker, Trewhitt Co., Inc., Oakland, $172,516.30.

Alpine County—SR 89—Between Markleeville and 0.6 mile northerly. Construct a graded roadbed, place imported base material and road-mix the upper inches. 0.6 mile. Contract awarded to Lee Const. Co., San Leandro, $49,999.70.

Amador County—SR 88—Between 2.0 miles south of Ione and the junction with Route 34. Construct a graded roadbed and surface with plant-mixed surfacing, completion of which will provide a highway on new alignment eliminating curves. 2.0 miles. Contract awarded to W. H. Darrough & Sons, Yuba City, $127,522.55.

Amador County—FAS 950—Between State Route 97, about 2.5 miles south of Ione and State Route 34. Construct plant-mixed surfacing on untreated base. 2.1 miles. Contract awarded to Claude C. Wood Co., Lodi, $66,280.

Amador, Calaveras, and San Joaquin Counties—At various locations. Surface with plant-mixed surfacing. 15.3 miles. Contract awarded to Rice Brothers, Inc., Lodi, $74,944.75.

Merced County—FAS 555—Between US 99 and Le Grande Road, on Plainsburg Road. Construct a graded roadbed and place plant-mixed surfacing on untreated base. 3.3 miles. Contract awarded to M. J. Ruddy and Son, Modesto, $135,841.60.

Merced, Stanislaus, and San Joaquin Counties—At various locations. Surface with plant-mixed surfacing and construct channelization. 21.9 miles. Contract awarded to A. Teichert & Son, Inc., Sacramento, $115,609.

San Joaquin County—US 99—Between Ripon and 0.2 mile west of Austin Road. Plant shrubs and trees. 3.6 miles. Contract awarded to Lou S. Tsunekawa, Stockton, $9,878.35.

San Joaquin County—At the State Highway District Shop and Maintenance Yard, in Stockton. Plant trees, shrubs, ground cover and lawn. Contract awarded to Stephen L. Vistica & Son, San Mateo, $8,835.80.

Solano County—US 40 and SR 12—At the intersections of Rockville Road with US 40 and Pennsylvania Avenue with Texas Street. Install traffic signal system and highway lighting and modify the existing traffic signal system. Contract awarded to R. Goold and Son, Stockton, $7,235.

Solano County—At various locations. Place plant-mixed surfacing and subseal with asphalt. 14.7 miles. Contract awarded to Frederickson Bros., Emeryville, $104,330.20.

Tuolumne County—SR 108—Between Twain Hart and McCoy Saddle. Place plant-mixed surfacing. 17.8 miles. Contract awarded to Beerman and Jones, Sonora, $104,152.

Imperial County—At various locations. Surface with road-mixed surfacing. 22.8 miles. Contract awarded to N. L. Basich, Garvey, $68,964.

Imperial County—SR 202—Between Route 12 near Coyote Wells Underpass and two miles west of Mt. Signal. Construct a graded roadbed and place road-mixed surfacing and construct two reinforced concrete bridges. 22.6 miles. Contract awarded to N. L. Basich, Garvey, $279,700.60.

Riverside County—SR 146—At various locations between Palo Verde and Wiley Hill Log Cabin. Surface with road-mixed surfacing. 6.4 miles. Contract awarded to F. H. Harris, San Bernardino, $21,685.

San Diego County—US 101—At Mission Avenue Overcrossing in Oceanside. Install metal plate guard railing. Contract awarded to Roy C. Ek, San Diego, $3,662.50.

San Diego County—US 80—Between Lake Murray Boulevard and 0.3 mile east. 0.3 mile. Grade, place imported subbase material, place plant-mixed surfacing on untreated base and apply seal coat, completion of which provides a two-lane frontage road. Contract awarded to Griffith Company, Los Angeles, $27,938.75.

San Diego County—US 395—Between Lake Hodges and Brotherton Road. Place plant mixed surfacing on the existing pavement and shoulders and apply seal coat. 2.0 miles. Contract awarded to Ralph B. Slaughter, Julian, $23,474.

San Diego County—SR 79—Between Cuyamaca and Julian. Surface with road-mixed surfacing. 7.2 miles. Contract awarded to Ralph B. Slaughter, Julian, $21,280.

San Diego County—SR 76—Between Oceanside and Bonball (portions). Surface with plant-mixed surfacing. 3.7 miles. Contract awarded to R. E. Hazard Contracting Co., San Diego, $13,981.20.

Evans Is Appointed Asphalt Institute District Engineer

Veteran California highway engineer Don G. Evans of Los Angeles has been named district engineer for the Asphalt Institute, serving Southern California and Arizona. In announcing the new appointment, President J. E. Buchanan of the Asphalt Institute said Evans would make his headquarters at Los Angeles.

In 1927 Evans centered his area of operations in California where he served with the California Division of Highways in various capacities until his retirement.

HARBOR FREEWAY

Continued from page 59 . . .

be dumped and spread in a windrow in about 20 seconds with no stopping of the vehicle.

The writer is resident engineer working under general supervision of Assistant District Construction Engineer Haig Ayanian, Assistant District Engineer Frank B. Cressy, and District Engineer W. L. Fahey. The Bridge Department representative is Fred H. Buck.

Representing the contractor on the job is G. F. McAfee. The contractor is making exceptional progress and it is anticipated that this freeway will be completed and opened to traffic considerably in advance of the estimated date for completion, which is June 18, 1956.

San Diego County—SR 198—Between 0.2 mile south of La Mesa City limits and Lemon Avenue. 0.6 mile. Place plant-mixed surfacing, construct concrete curbs and sidewalks and apply seal coats. Contract awarded to Daley Corp., San Diego, $14,587.

San Diego County—SR 75—Between Coronado Heights and R. H. Dana Place. Construct graded roadbeds and place plant-mixed surfacing on cement treated base and existing pavement and construct four reinforced concrete bridges at Silver Strand State Park Undercrossing, and three at Silver Strand State Park Pedestrian Undercrossings, completion of which will provide a four lane divided highway together with ramps and undercrossing. 7.8 miles. Contract awarded to Daley Corp., San Diego, $768,038.70.

San Diego and Imperial Counties—At various locations. Surface with plant-mixed surfacing. 11.7 miles. Contract awarded to R. E. Hazard Contracting Co., San Diego, $75,748.

HARRY L. KILE

Continued from page 49 . . .

continuing need to "get out of the mud" and partly because of the lack of usable data about traffic.

Among Kile's other contributions to the science of highway planning is the development of accident analysis techniques which led to the present punch-card tabulation system of accident records.

Mr. and Mrs. Kile have lived in Davis since 1928. He is a member of the Faculty Club at the University of California, Davis campus. The Kiles have a daughter living in Berkeley, and a three-year-old grandson.

EARL A. PARKER

Continued from page 49 . . .

war period, "Ace" was assigned to the District Traffic Department. Here he made some of the first traffic studies for the famous four-level traffic interchange structure at the crossing of the Harbor-Pasadena Freeways and the Hollywood Freeway. When construction began after the war, he was assigned as resident engineer on the first contract on the Santa Ana Freeway. With the expanding construction program following the war, "Ace" was appointed as field supervisor over all construction jobs in District VII. He was appointed senior highway engineer in 1950.

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APO 633, New York, N Y

California Highways and Public Works, Sacramento, California

GENTLEMEN: I recently reviewed a copy of your excellent publication, *California Highways and Public Works*. This publication was found at one of our air depots in France.

If possible, I would like to be placed on the distribution list for this publication.

Very truly yours,

F. L. NEWMAN
Chief Safety Engineer

SIERRA BUTTES

This picture was taken a few miles east of Sierra City from State Sign Route 49 in Sierra County

GOODWIN J. KNIGHT
Governor of California

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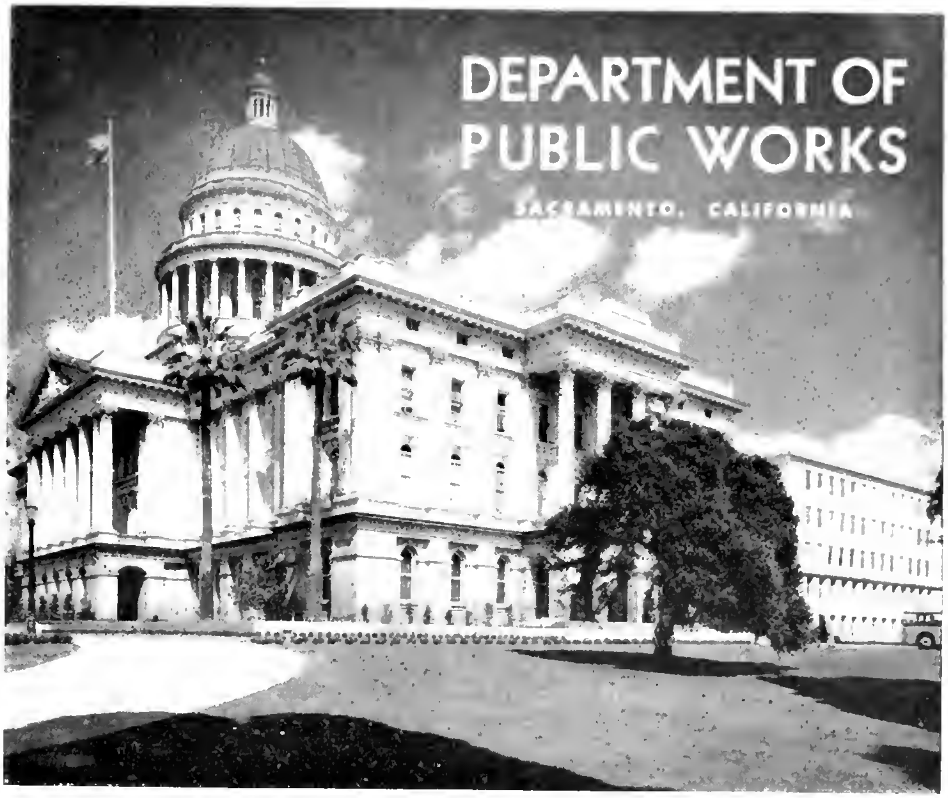

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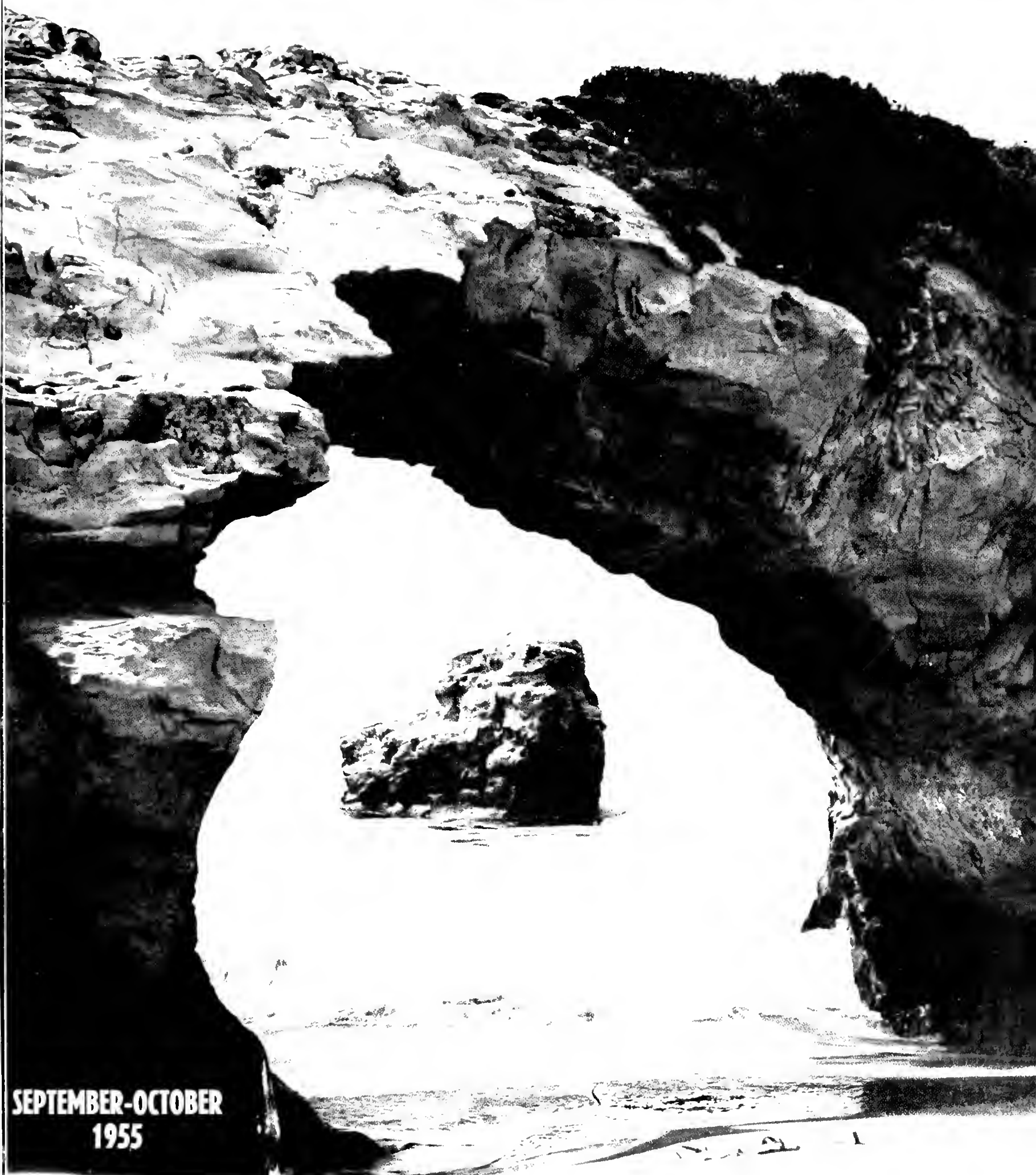

SEPTEMBER-OCTOBER
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CONTENTS

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CALIFORNIA HIGHWAYS AND PUBLIC WORKS
P. O. Box 1499
Sacramento, California

Santa Ana Freeway *Has Induced Industrial and Recreational Development*

By W. L. FAHEY, District Engineer, District VII

THE SANTA ANA Freeway is one of the most important traffic arteries on the system of freeways being constructed by the State Division of Highways to serve Southern California. This freeway extends from the easterly terminus of the Hollywood Freeway at Spring Street in the Los Angeles Civic Center in a generally southeasterly direction for a total length of 42.8 miles through the Cities of Buena Park, Anaheim, Santa Ana, and Tustin to a junction with the San Diego Freeway near the Town of El Toro. This freeway, following as it does a northwesterly-southeasterly direction generally paralleling the Pacific Ocean coastline, makes it of great strategic value because so many of the other important traffic arteries in this part of the State have been established in a generally northerly-southerly or easterly-westerly direction.

W. L. FAHEY

Benefits Two Counties

Measured in travel time, the Santa Ana Freeway brings Orange County closer to the Los Angeles metropolitan area, and this is proving of immense benefit to both areas. The development of critically needed housing projects and large industrial manufacturing plants along the route of the Santa Ana Freeway is an indication of the economic value of this freeway. Since the last issue of *California Highways and Public Works*, three important events have occurred that affect the Santa Ana Freeway.

Winston Brothers Construction Company of Monrovia completed its $2,000,000 construction contract and opened the 2.5-mile southerly extension of the Santa Ana Freeway from First Street in the City of Santa Ana, through the City of Tustin and southerly to Browning Boulevard. Winston Brothers are not newcomers in the freeway construction field. They have successfully carried out prior construction on the Santa Ana Freeway, the Hollywood Freeway, and now have in progress two adjoining contracts on the San Bernardino Freeway that will complete 9.4 miles of this freeway between West Covina and Pomona at a cost of $5,500,000.

The second event was the completion of four undercrossing bridges to carry county road traffic arterials over the Santa Ana Freeway between the Town of Norwalk and the City of Buena Park by the contractors, Ukropina, Polich, Kral, and Ukropina of San Gabriel. This contracting organization has on the Santa Ana Freeway completed seven previous contracts of freeway construction for which the contract allotments total $10,923,000. This important construction, recently completed between Norwalk and Buena Park at an estimated cost of $1,050,000, made it possible for the first time to eliminate all existing traffic crossings at grade and take out the traffic signals that were a serious impediment to the free flow of traffic on this portion of the Santa Ana Freeway that had been previously built to expressway standards.

Longest Full Freeway

With the completion of these grade separation bridges, the Santa Ana Freeway became a full freeway for the entire 18.8 miles in Los Angeles County. Combining this mileage with the 10 miles of the completed Hollywood Freeway, which in effect is a northwesterly extension of the Santa Ana Freeway, motorists traveling between the San Fernando Valley in Los Angeles and Buena Park in Orange County have available a total length of 28.8 miles. This is the longest stretch of full freeway in Southern California.

The third event that created considerable impact traffic-wise on the Santa Ana Freeway was the opening of Disneyland. Disneyland is located in Orange County just westerly of the Santa Ana Freeway intersection with Harbor Boulevard. It is reported that 27,742 visitors were attracted to Disneyland on Monday, July 18, 1955, when the park officially opened its gates to the general public. Some 25,000 invited guests were present the day before at the official dedication ceremonies. California Governor Goodwin J. Knight was present and play a prominent role in the dedication.

Governor Pays Tribute

In his message commemorating the opening, Governor Knight said:

> "We in California are proud of Disneyland and of our fellow Californian, Walt Disney. For a quarter of a century, he has consistently and tirelessly worked to provide fine, wholesome entertainment to millions of American families. Many of the characters he has created have become universal symbols of laughter and happiness to young and old alike. Disneyland is a monument to humanity's desire for happiness and enjoyment of life's blessings."

Since location in this unique park was of prime importance, Walt Disney retained the Stanford Research Institute in June, 1953, to make an extensive site and location study. The Stanford project was under the direction of C. B. Wood, Jr. The institute is a nonprofit corporation affiliated with Stanford University. It conducts extensive research for government and private industry.

The considerations in selection of the site were of more than passing interest to the Division of Highways. Aside from the traffic effect on state highways serving the area, it constitutes an outstanding example of the benefit of freeways. The evaluation process, similar in some respects to those of other major industries and developments adjacent to freeways, is concrete evidence of the economic importance of the growing freeway system.

Selection of the site from among many possible sites was made after a year's study in location analysis and a complete search of land records. Among other qualifications, utility conditions, accessibility, topography and envionmental characteristics were considered. Even annual rainfall figures helped in making the final decision. During this period Stanford Research Institute conducted a complete economic feasibility study of the entire Disneyland project. This included a thorough survey of attendance patterns for amusement areas and the projection of an annual rate of operation for Disneyland.

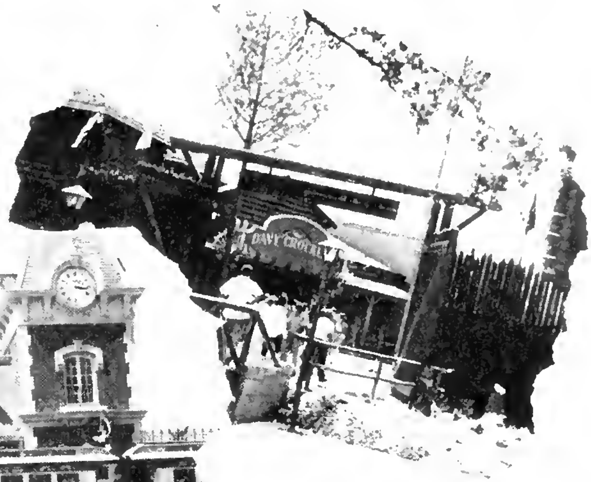
Report Cites Benefit of Freeway

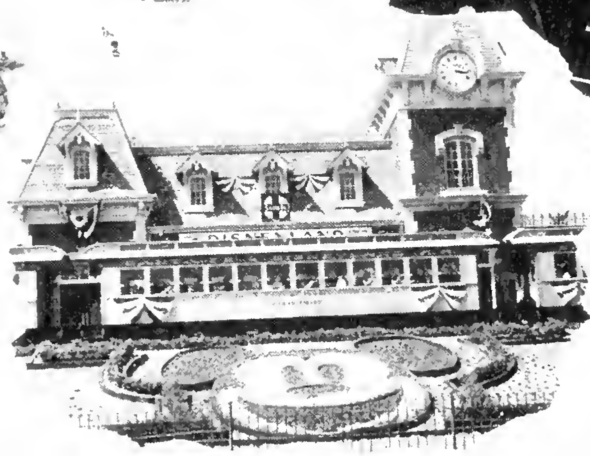
In carrying out the comprehensive investigation for the Walt Disney productions that resulted in the selection of the present site for Disneyland, the Stanford Research Institute on August 28, 1953, submitted a report entitled, "An Analysis of Location Factors for Disneyland." The advantages and disadvantages of many possible sites over a wide-spread area were considered and analyzed. This report placed great emphasis upon the traffic carrying potentialities of the Santa Ana Freeway, and in the analysis of all of the possible sites that were considered in the Orange County area, the proximity of the Santa Ana Freeway was noted and considered in detail. The fact that the site for Disneyland as finally selected and developed lies close to the Santa Ana Freeway and its intersection with Harbor Boulevard is an indication of the value which the investigators placed upon the Santa Ana Freeway for providing adequate vehicular ingress and egress.

An interesting phase of the problem that developed from the Stanford research investigations was the analysis that was worked out from a consideration of "A Theoretical Peak Day At Disneyland." At the start of this particular problem, statement was made: "On the theoretical peak day the admissions will be primarily limited by the ability of one lane of the Santa Ana Freeway to deliver cars to Disneyland. Additional admissions arriving over routes other than the Santa Ana Freeway will be roughly proportional to the population densities in the areas feeding these other routes."

It was concluded that coming from the northwest into Disneyland the

Looking southeasterly showing new homes built within last three years adjoining Dallison Drive between Florence Avenue from which this photograph was taken and the Southern Pacific Railroad over which grade separation bridge on Santa Ana Freeway is shown in background, left





UPPER—Medieval castle with moat and drawbridge that provide the entrance to "Fantasyland." Dock in "Adventureland" with boat about to take on new load of passengers to make tour of the rivers of the world. CENTER—Steamboat coming around the bend. The "Mark Twain" Frontierland's 105-foot paddle-wheeling river boat about to make a landing. Main entrance to Disneyland showing in foreground Mickey Mouse reproduced in flowers and Santa Fe and Disneyland Railroad passenger train. Entrance into "Frontierland." LOWER—Main Street Plaza, U. S. A., showing Disneyland City Hall and horse-car transportation system in operation. A glimpse of "Tomorrowland." Transportation and communication as they may be many years hence are shown.

Santa Ana Freeway would carry 62 percent of the total traffic into Disneyland, whereas coming from the southeast into Disneyland via Katella Street, the Santa Ana Freeway would bring in 13 percent of the Disneyland traffic. Thus the Santa Ana Freeway can be expected to handle 75 percent of the traffic to Disneyland. In this manner, the importance of the Santa Ana Freeway as a traffic carrying facility to Disneyland was conclusively established by the Stanford Research Institute.

The Santa Ana Freeway exerts a great influence on the industrial and residential growth within its sphere of influence. It is a strong factor in the huge industrial expansion that is occurring easterly and southeasterly of Los Angeles. John F. Kelly and Edward P. Riley, Right of Way Agents for the Division of Highways, writing in the July-August, 1954, issue of *California Highways and Public Works*, have presented in detail the advantages that the Santa Ana Freeway offers to the development of industrial business. They presented the views of representatives of many companies operating industries along the Santa Ana Freeway and summarized their findings as follows:

"1. The freeway is distinctly a property appreciation factor to adjoining property.

"2. The freeway is an asset from an advertising standpoint to business located on a frontage road.

"3. Moving to an industrial location near the freeway has made it possible to retain customers discouraged by traffic congestion.

"4. The freeway contributes immeasurably as a convenience factor to employees and business associates.

"5. Industrial location on frontage road along the freeway accounts for additional business per month which is attributable entirely to prospective customers using the freeway.

"6. The freeway facilitates distribution of goods. Crosstown delivery from south to north has been reduced to one-third the former time.

"7. The freeway is advantageous in directing customers to the plant without their getting lost on unknown industrial streets.

Enhanced Land Values

"The enhanced land values and the enthusiastic endorsement by the property owners conducting business along these

Looking northwesterly toward Santa Ana-San Bernardino interchange with widening construction in progress on Los Angeles River bridge shown center left

LEFT—Looking southeasterly along Santa Ana Freeway showing overpass bridges for Florence Avenue and traffic interchange roadways. It is interesting to note that substantially all of the homes shown in this photograph were constructed within the last five years, for the most part during the period when the Santa Ana Freeway was under construction. RIGHT—Looking southeasterly showing Lever Brothers Manufacturing Company's $15,000,000 plant adjacent to Santa Ana Freeway.

frontage roads is conclusive evidence that when industrial improvement represents the highest and best use for land, the location of an industrial site in close proximity to a freeway is a definite advantage."

While this study of Messrs. Riley and Kelley did not include the part of the Santa Ana Freeway in Orange County it is a foregone conclusion that substantially the same findings would have resulted because new industries are continually springing up along this freeway in the Orange County area.

On this same general subject Harry E. Bergh, Planning Director for Orange County, in commenting recently on the Santa Ana Freeway, said:

"For a period of about 20 years prior to actual commencement of the program to convert Manchester Avenue to a freeway the Orange County Planning Commission has recognized the great importance of this route as an arterial connection between central Orange County and the Los Angeles metropolitan area.

"The commission through its recommendations to the board of supervisors in the adoption of zoning regulations included special set-back lines to protect the route for future widening. These regulations were zealously adhered to by the commission in its administration of the constant demand for special zoning permits to the end that when the time came to proceed with conversion of the old two- and three-lane route into a modern freeway great costs were saved in removal of buildings which would undoubtedly have been erected as close as possible to the former narrow roadway.

"Furthermore, when the outward reach of industrial development began to evidence itself in demand for large factory sites in Orange County and it was especially desirable for the manufacturer to have a 'front-window' on this great arterial the commission saw, and grasped, the opportunity to further protect this route by its recommendation for development of these sites with adequate off-the-highway parking and coordination of egress and ingress for the sites with the State Division of Highways.

"This procedure of the planning function in government thus added great taxable value to the county; it gave the industrialists sites which are especially valuable to their needs, and, since the plants occupy large acreages, it removed thousands of feet of frontage on the freeway from the threat of 'shoestring' or fringe type roadside business development."

Orange County Benefited

William Gallienne, Executive Secretary of the Associated Chambers of Commerce of Orange County, recently in discussing the Santa Ana Freeway, said:

"The effect of the Santa Ana Freeway on industrial growth and residential development is an interesting study. There is no doubt, of course, that the Santa Ana Freeway played a potent part in bringing industry to Anaheim and Fullerton; likewise, the Santa Ana Freeway has materially helped the residential development from Buena Park through Anaheim and Fullerton and on to Santa Ana and Orange.

"It could be said that the Garden Grove home development which is probably the greatest in Orange County stems from the fact that people can travel via Highway 39 and hit the Santa Ana Freeway, and be in Los Angeles in almost 30 minutes.

"Our predicted population for Orange County in 1960 is 500,600 people. However, at the rate we are going with almost 400,000 people now, we will probably have approximately 600,000 or 650,000 in 1960."

One of Early Freeways

In point of time the Santa Ana Freeway ranks as one of the earliest freeways initiated for the Los Angeles area. It may be considered as starting in 1933 when Lloyd Aldrich, City Engineer for the City of Los Angeles, who recently retired from city service, was instructed by the Los Angeles City Council to investigate and prepare preliminary plans for the construction of a new viaduct for Aliso Street. The then existing steel girder bridge at this location had proved inadequate to serve vehicular traffic and the double tracks of the Pacific Electric Railway Company. Grade crossings over the tracks of the Santa Fe Railway Company and the Union Pacific Railroad Company were the cause of much traffic delay. It was apparent that the proposed improvement would do much to correct the intolerable traffic situation that had developed even as early as 1933.

This important construction project was started on November 6, 1939, by the City of Los Angeles as a cooperatively financed Federal Works Progress Administration project. In addition to the funds supplied by the Federal Government, contributions toward financing the project were made by the State, the county, the city and the railroad companies. At the conclusion of the WPA work, a city contract was let to the Contracting Engineers Company to finish incomplete portions of the project. It was finally completed and opened to the public by appropriate ceremonies on August 14, 1944. This unit of construction by the City of Los Angeles at the junction of the Santa Ana Freeway and the Ramona Freeway, as it was then called, became an essential part of these two freeways.

Earl Warren Comments

Earl Warren, now Chief Justice of the U. S. Supreme Court, who was then the Governor of California, said:

"On the occasion of the dedication of the Aliso Street Viaduct, it is a pleasure to extend greetings and congratulations to the City of Los Angeles and to the County of Los Angeles.

"This $5,000,000 project is an excellent example of what cooperation between the State and local political subdivisions can accomplish in the development of our great California Highway System. The Arroyo Seco Parkway is another outstanding monument to this sort of cooperative effort. The State is justifiably proud of its contribution of $746,123 to this undertaking.

"The Aliso Street grade separation is another long step forward in solving vehicular traffic congestion in the downtown area of Los Angeles. Over the viaduct will flow a huge volume of such traffic from the proposed Ramona Parkway and the Santa Ana and Hollywood Parkways, both of which are on the postwar program adopted by the California Highway Commission.

"Recognizing the future needs for freeways in large metropolitan centers, the Highway Commission is giving much study to this type of highway development and the Aliso Street Viaduct is a component part of its planning in this direction."

New Traffic Facility

This construction by the City of Los Angeles that was completed on August 14, 1944, was hailed by all as an outstanding engineering achievement and rightly so. On that day there was no thought that vehicular traffic would so increase in the short span of 10 years that major reconstruction at this location in the amount of $2,850,000 would be necessary, but such has proven to be the case.

Photograph by Assistant Resident Engineer Tom Chew, showing prestressed precast reinforced concrete girder 80 feet long, weighing 24 tons, being swung into place to widen Santa Ana Freeway bridge over Los Angeles River.

On January 14, 1954, a contract amounting to $513,400 was awarded to Charles MacClosky of San Francisco for the construction of a new interchange bridge to carry westbound traffic on the San Bernardino (Ramona) Freeway southbound on the Santa Ana Freeway. With the completion of this high level bridge on July 12, 1955, westbound motorists on the San Bernardino Freeway who desire to travel south on the Santa Ana Freeway make the interchange directly and easily. They no longer have to pull off at Mission Road and make two very difficult left turns in order to get onto the Santa Ana Freeway.

This new traffic facility is also proving of great advantage to inbound motorists on the San Bernardino Freeway who desire to go to the easterly section of downtown Los Angeles business district because they can now take the new high level bridge, proceed southerly on the Santa Ana Freeway, and utilize whichever exits are most convenient for them at First Street, Fourth Street, and Seventh.

Starting on page 30 of the March-April, 1955, issue of *California Highways and Public Works* resident engineer Warren B. James' story entitled, "Prestressed Girders," described this construction. He also explained how the use of prestressed precast reinforced concrete girders in the portions of the new bridge that spanned the freeway traffic lanes greatly expedited the completion of this structure and caused much less interference with public traffic.

Aliso Street Widened

On July 16, 1954, a contract was awarded Öberg Brothers Construction Company of Inglewood that provided for widening the Aliso Street viaduct a minimum amount of 41 feet so that it could be converted into an eight-lane freeway. The contract allotment for this project was $2,034,500. This contract is now substantially completed.

Motorists in the Los Angeles area have had occasion during the past year to become familiar with this construction work easterly of the Los Angeles Civic Center, across the Los Angeles

River and at the junction between the San Bernardino and Santa Ana Freeways. There is no location in Southern California where reconstruction of existing highway facilities to convert to modern freeway standards have been carried out under such severe conditions of vehicular traffic movements.

There are some 129,000 vehicles per day utilizing this section of freeway. The State's contractors were able to make no move whatsoever in going forward with their construction work without first considering the effect on public traffic. They must assure themselves that whatever operations they started could be carried out with safety for their own employees and also with safety for the passing motorists. The fact that so much work has been accomplished since reconstruction work was first started in this area early in 1954 without there having been serious accidents resulting from construction operations certainly indicates very commendable and careful management on the part of the State's contractors.

Public traffic has been discommoded by construction work in progress. This has been evident every day as one saw long lines of vehicles moving through construction operations at reduced speed. The Los Angeles City police officers of the Traffic Division under Deputy Chief Harold Sullivan are to be complimented for their efficiency in handling and directing traffic through construction. Many serious traffic snarls have been avoided due to their efforts, and the construction schedule has been speeded up.

Project Speeded Up

Questions have been asked us as to why this construction has taken so long and why haven't more efforts been made to speed things up. Everything possible to speed up operations has been done.

In designing this extensive reconstruction project and in preparing the contract specifications the State Division of Highways has done many things to expedite the work and to shorten the period of construction. The shortest possible time limits were established for doing the required construction. In order to keep traffic moving smoothly in six lanes during the construction period, a temporary timber trestle 10 feet wide and 200 feet in length was designed and constructed over Center Street so as to widen the bridge sufficiently to provide the six lanes. Another item to expedite the work was the utilization of prestressed precast reinforced concrete girders 80 feet long, weighing 24 tons each, to be placed as the bridge deck over the Santa Fe Railway on the west bank of the Los Angeles River and over the Union Pacific and Southern Pacific Railroads on the east bank of the Los Angeles River. By this efficient method, the customary placing of falsework on railroad right of way that would have greatly interfered with the railroad traffic was avoided, construction operations were speeded up, and the time of construction was greatly reduced since these girders could be fabricated at the same time other work was in progress.

Construction Time Saved

Another item of design that is speeding up the work is the carrying out of the plan for utilizing most of the old girders over Mission Road. The utilization of this portion of the existing bridge structure by remodeling as necessary to fit it in with the new highway grade system was a great time saver. Another feature of the design which made it possible for the contractor to save construction time was the determination of span

Looking easterly from Santa Ana Freeway showing industrial development along frontage road in East Los Angeles area

Looking northeasterly showing toward background the section of the Santa Ana Freeway and Harbor Boulevard with Disneyland in foreground

lengths to permit maximum reuse of contractor's forms and falsework.

Speeding up of construction work has been accomplished by good planning on the part of the contractors. Methods for extensive multiple use of forms have been worked out, and methods for moving large units of falsework intact have been frequently utilized. The forms and falsework for the north half of the Center Street undercrossing were moved on rollers as a unit into place for building the south half of the separation. The 242-foot Los Angeles River arch rib falsework was moved intact from the south rib to the north rib. This included the soffit forms for the rib. Most of the falsework bents on the west approach spans were moved intact from span to span. In this manner much time was saved.

It is anticipated at this time that all contract work in this area will be entirely completed and ready for final acceptance during October, 1955.

The pressing need for a new highway arterial between the Los Angeles central business district southeasterly through the industrial area and extending into Orange County was quite generally recognized some 20 years ago. To list by name all the civic-minded individuals who have had an important part in the development of the Santa Ana Freeway would be an impossible task because so many of the important contributions by some individuals would be certain to go unnoted. The same can almost be said even of an attempt to list the various organizations which had an important part in developing the Santa Ana Freeway.

Early Reports on Freeways

Turning to the earlier reports that were first published that served to focus public attention on the great traffic need for freeways was the publication by the Engineering Department of the Automobile Club of Southern California of a report dated April 16, 1937, entitled, "Traffic Survey, Los Angeles Metropolitan Area." In this report routings were shown for new "motorways" radiating in all directions from the downtown Los Angeles area. Later, under date of December 7, 1939, a comprehensive report was made by the City of Los Angeles Transportation Engineering Board, the Citizens Transportation Survey Committee, and the Works Progress Administration, in which a new proposed highway arterial between the Los Angeles downtown area extending in a general southeasterly direction toward Orange County was advocated. These arterials were called "parkways," and portions of those routes designated on the map accompanying this report that are labeled "Ramona Parkway," "Long Beach Parkway Extension," "Olympic Parkway," and the "Santa Ana Parkway" approximate quite closely the present routing of the Santa Ana Freeway. In this report credit is given to other cooperating agencies as follows: Los Angeles Traffic Association, Central Business District Association, Los Angeles County Regional Planning Commission, and the Automobile Club of Southern California.

Future Routes Protected

The Los Angeles County Planning Commission and its counterpart in Orange County, the Orange County Planning Commission, through their control of subdivisions have been instrumental in protecting future freeway routes from encroachments by proposed subdivisions, housing projects, and industrial developments that would have otherwise increased the later costs of right-of-way acquisition. Another important publication which gave further support to the Santa Ana Freeway development was the report by the Los Angeles Metropolitan Parkway Engineering Committee dated March 30, 1946, entitled, "Interregional, Regional, Metropolitan Parkways." This report gave valuable information to the Joint Fact-finding Committee on Highways, Streets and Bridges of the California Legislature in its deliberations prior to the adoption of the Collier-Burns Highway Act of 1947, the passage of which greatly increased state highway funds available for freeway construction.

The Collier-Burns Act discontinued as such the one-fourth cent of gas tax previously allocated to state highway routes through cities. In the over-all additional financing which it provided, it passed the complete responsibility to the State of California for constructing and maintaining all state highways through all cities within the State.

First Contract

The first contract awarded by the State Division of Highways on the Santa Ana Freeway was for the section from Kearney Street to Soto Street. This was awarded January 16, 1946, and completed December 11, 1947. Since that time a total of 68 major contracts have been completed, having a total value of $34,000,000. At the present time four major construction contracts are now in progress, totaling $10,000,000. All of these are now in final stages of completion, having already been opened to public traffic.

Other contractors who have completed construction contracts on the Santa Ana Freeway and who have not been previously mentioned in this story are the following:

Peter Kiewit Sons' Co., Byerts & Dunn, Mike Radich & Co., J. E. Hoddock, Ltd.,

Looking southeasterly along the Santa Ana Freeway showing in foreground recently completed Shoemaker Avenue Overpass Bridge. The other three recently completed bridges at Carmenita Road, Alondra Boulevard, and Valley View Avenue are shown in background.

W. J. Distelli, Spencer-Webb Co., Jannoch Nurseries, Vido Kovacevich Co., Electric and Machinery Service Inc., Huettig, Schromm, & Bennett, Econolite Corp., Sully-Miller Contracting Co., Ralph A. Bell and United Concrete Pipe Co., Ets, Hokin and Galvan Inc., C. O. Drauker, Inc., Westates Electrical Construction Co., Clinton Electric Corp., Henry C. Soto Corp., Webb and White, Fischbach and Moore Inc., George W. Peterson and Jack W. Baker, Newbery Electric Corp., Justice-Dunn Co., A. S. Schulman Electric Co., C. O. Sparks and Mundo Engineering Co., D. & M. Sprinkler Co., K. E. C. Company, Ed Seymour, Wulfert Co. Inc., Contracting Engineers Co.

Right-of-Way Acquisition

Right-of-way acquisition on the Santa Ana Freeway has progressed in an orderly manner with a minimum number of condemnation proceedings being required. To date there has been expended for rights of way a total of slightly more than $16,000,000. Thus completed construction, construction in progress, and rights of way now represent a total investment of $60,000,000.

There have been many interesting features in connection with the development of the Santa Ana Freeway that have been previously reported in *California Highways and Public Works*.

In the November-December, 1953, issue, J. W. Greene of the Bridge Department reported construction difficulties at the Simons Underpass where there was built a structural steel through girder-type bridge carrying the two main line tracks and two lead tracks of the Santa Fe Railroad across the Santa Ana Freeway. It consists of two spans each, approximately 104 feet long, supported on reinfrced concrete abutments and a center pier of structural steel columns. There are four structural steel girders connected by 21-inch and 30-inch floor beams, with a total weight of 1,250 tons. The interior girders are over 11 feet in depth and weigh 192 tons each. They were fabricated in three parts, the largest weighing 76 tons. These interior girders weigh over one ton per foot, being possibly the heaviest per foot that the Bridge Department has yet designed. The two interior steel columns weigh 23 tons each. There are about 3,000 cubic yards of concrete in the abutments, wingwalls and center pier footings. The Simons Underpass was completed and opened to the full load of railroad traffic on October 6, 1952.

Looking southeasterly along the Santa Ana Freeway showing grade separation with Santa Fe Railroad and Lincoln Street Overcrossing. On the right side of the freeway are shown new subdivisions and homes that were built during and since the freeway construction.

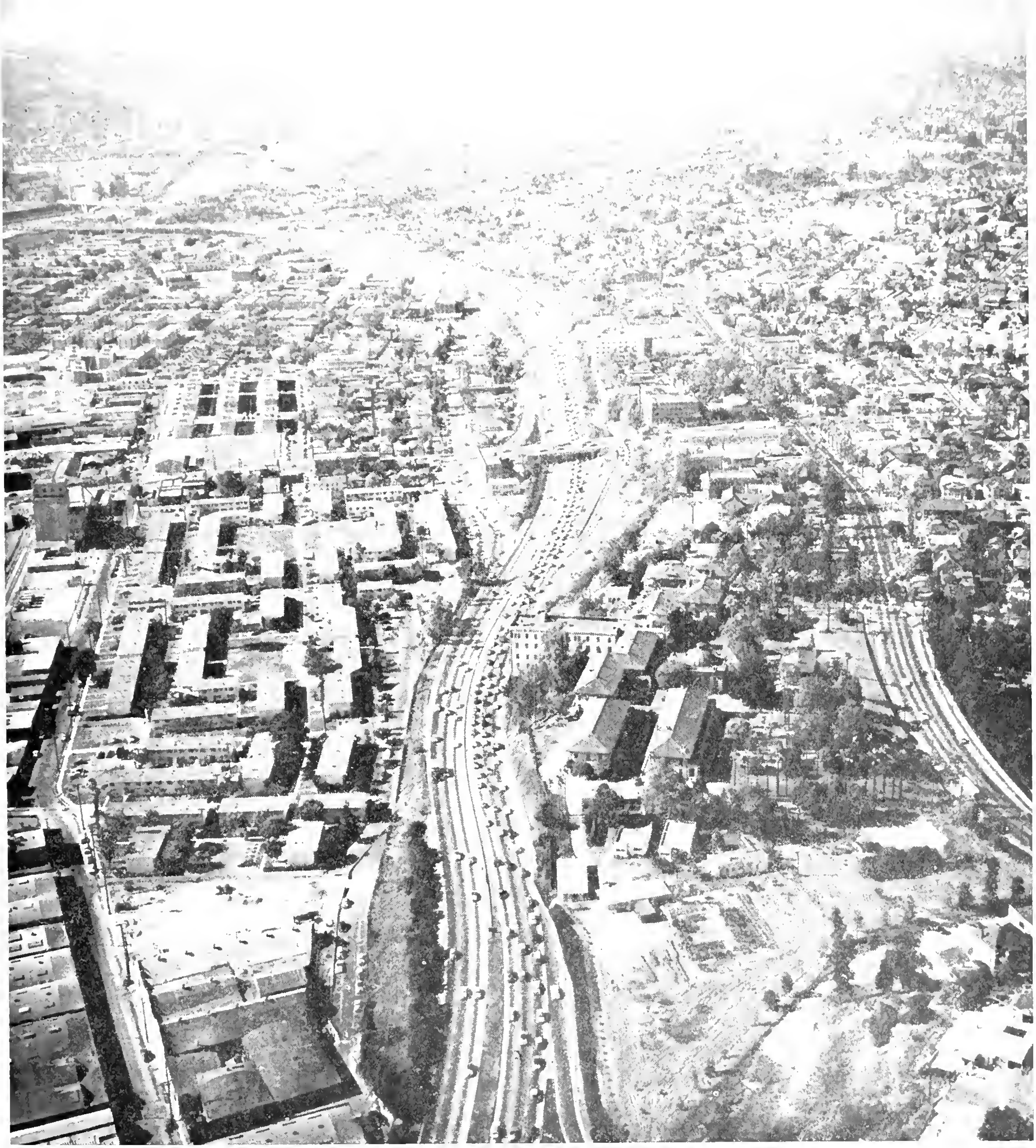
Projects Described

Also in the November-December, 1952, issue is a story entitled, "Norwalk Diagonal," by M. E. Cessna, district engineer, retired. This important link in the Santa Ana Freeway, extending from Rosemead Boulevard northerly of the Town of Downey to Rosecrans Avenue southerly of the Town of Norwalk, was approximately five miles long. This area has been the scene of intensive residential development. A few years ago the land passed through was almost exclusively agricultural, being largely in orange groves, while today thousands of new homes are visible on both sides of the freeway and very little acreage is left for future housing, industrial, or business development.

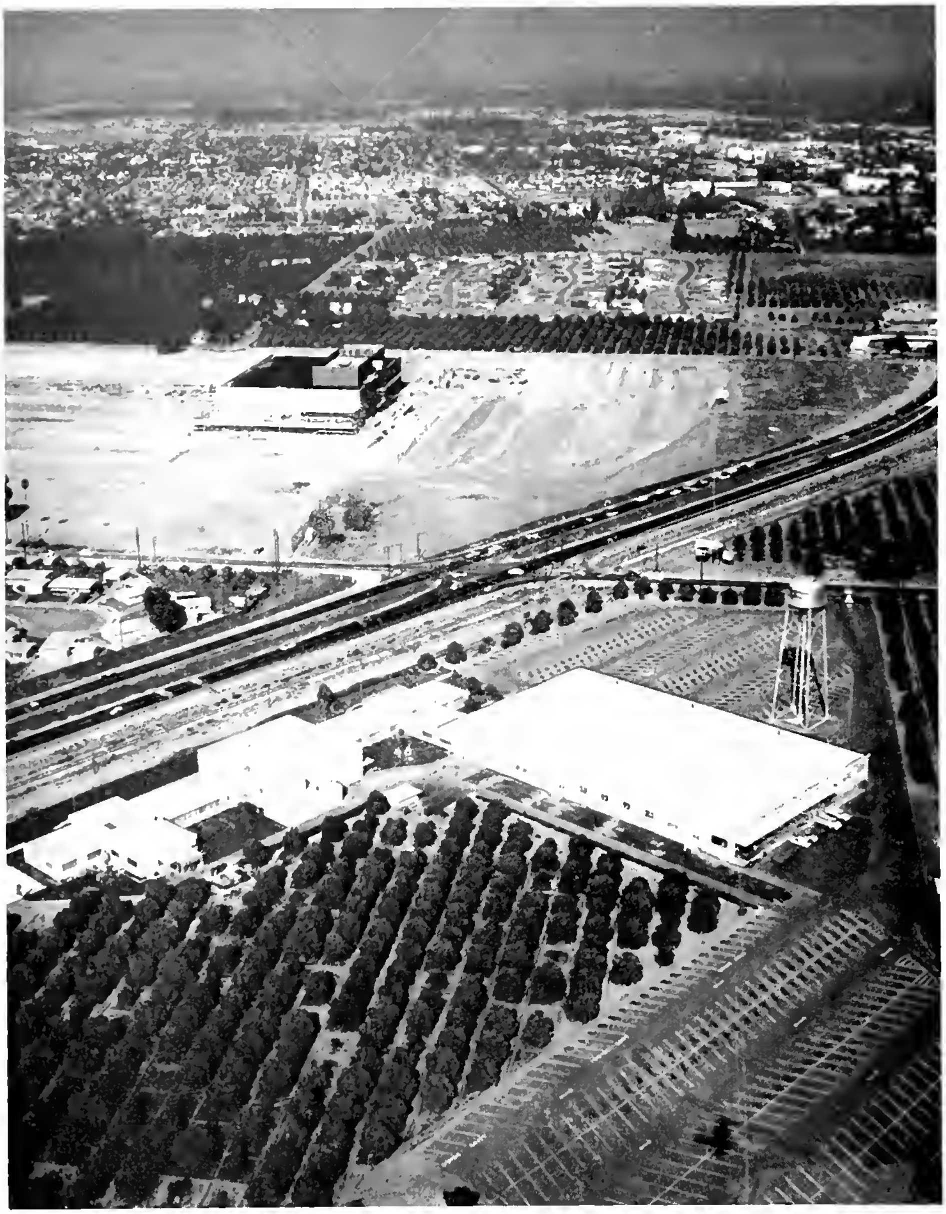
In the January-February, 1953, issue of *California Highways and Public Works*, J. M. Curran, associate bridge engineer, described the unusual construction on the bridge to carry the Santa Ana Freeway over the Rio Hondo, which is located southeasterly of the City of Los Angeles. The bridge is a steel girder structure 635 feet long consisting of seven 83-foot spans and one 52-foot span. A bridge roadway 88 feet wide provides two 40-foot wide roadways, and an 8-foot median or dividing strip, to carry the six traffic lanes of the freeway. Since pedestrians are not allowed on freeways there are no public sidewalks on this bridge, although there are two 1-foot 9-inch walkways for maintenance workers.

Pile Driving Difficult

The seven piers and two abutments are founded on cast-in-place concrete pile-supported footings. Piles were driven to an average penetration of 40 feet below the river bed to insure against scour in the fine sandy channel bottom formation. Due to this fine sand formation the driving of piles was very difficult and jetting of piles



Looking northerly along Santa Ana Freeway in East Los Angeles area from above Sixth Street, showing Fourth Street Overcrossing in center



Looking easterly showing, center left, new Broadway-Anaheim Shopping Center under construction in City of Anaheim, with extensive parking space provided for shoppers adjoining the Santa Ana Freeway. In foreground is shown manufacturing plant of Robertshaw Fulton Controls Company, with adequate parking space provided convenient to buildings.

was required for almost their entire penetration.

The designers of the bridge specified unusual welding methods to meet the design requirements of the 83-foot long spans by using transformed rolled steel beams rather than by using conventional fabricated steel plate girders. These usual methods are described in detail by Mr. Curran.

Starting on page 51 of the July-August, 1955, issue of *California Highways and Public Works* is a story by resident engineer James L. Needham describing the Winston Brothers contract on the Santa Ana Freeway between Browning Avenue and First Street. The newly completed pavement was opened to public traffic during September and final completion of this contract is scheduled during October, 1955.

Important Orange County Contracts

Another important Santa Ana Freeway contract scheduled for completion in October, 1955, is the construction at Harbor Boulevard in Orange County between Santa Ana and Anaheim. This contract, being carried out by J. A. Thompson & Son of Inglewood, provides a bridge to carry Harbor Boulevard, an important Orange County arterial, over the freeway, and the necessary traffic interchange roadways. The contract allotment is $403,000. Completion of this contract will remove another set of traffic signals from the freeway that have been a frequent cause of delay to the free flow of traffic in this area.

A very important unit of the Santa Ana Freeway from Broadway in Santa Ana extending northerly 2.6 miles to Lewis Street was awarded February 3, 1955, to the Griffith Company of Los Angeles. The contract allotment is $4,385,700. The contract is now reported as 20 percent complete, and the estimated date for final completion is December, 1956. Due to very complicated traffic movement in the vicinity of Orange County Hospital where the Santa Ana Freeway crosses Chapman Avenue and the further problems introduced by proximity of the Southern Pacific Railroad, the grade separation structures and the system of traffic interchange roadways that were necessary at this location necessitated one of the most intricate and extensive interchange systems that have yet been designed and constructed.

Later on this fall it is expected that advertising will be placed for the major portion of the last remaining unit of construction on the Santa Ana Freeway between the City of Santa Ana and the City of Los Angeles to convert the existing expressway to a full freeway extending from Ball Road just northwesterly of Harbor Boulevard to Coyote Creek. This includes line changes for the new freeway through the City of Anaheim and the City of Buena Park. The project is 6.5 miles in length and is to be financed from the 1955-56 budget which provides $5,502,000.

Early next spring it is anticipated that a contract will be let for the short section of the Santa Ana Freeway that involves grade separation structures at Orangethorpe Avenue and Magnolia Avenue between the Cities of Anaheim and Buena Park that cannot be included in the construction that will be advertised this fall.

Thus it appears that by midyear 1957 about 35 miles of the Santa Ana Freeway will be completed to full freeway standards to Browning Avenue south of Tustin.

Plans are now in progress to extend the construction of this freeway southerly from Browning Avenue 7.8 miles to its southerly terminus at junction with the San Diego Freeway near El Toro. This future construction necessary to complete the Santa Ana Freeway will be financed from subsequent fiscal year construction budgets as the California Highway Commission determines that funds are available for this purpose.

As the population of Los Angeles County and Orange County has grown there has been a corresponding increase of motor vehicles using the Santa Ana Freeway. Following is a summary of our annual 16-hour July counts for the last six years southeasterly of Buena Park. These illustrate the growth of traffic on the Santa Ana Freeway largely as a result of land development in Orange County:

	16-hour July count, Sunday	*6 a.m.-10 p.m., Monday*
1950	18,322	12,449
1951	24,914	16,684
1952	28,379	20,281
1953	29,477	22,243
1954	37,182	31,437
1955	45,056	45,618

The increase in traffic has been so great that in the not too far distant future it is certain that all sections that have been constructed as a four-lane freeway will require widening to six lanes. This contingency was foreseen years ago during the planning of the Santa Ana Freeway and all rights of way that have been obtained are ample to convert the four-lane sections of this freeway to six lanes. Provisions have also been made for this contemplated widening in the design of bridge structures and the roadbed section. The future widening can be carried out, whenever funds can be made available for this additional construction by the Highway Commission, with a minimum of additional cost and little inconvenience to public traffic.

The Santa Ana Freeway stands as a symbol of what can be done when there is wholehearted cooperation on the part of county, city and state officials, and public spirited organizations and individuals. Its successful progress is in no small measure due to the high type of leadership provided District VII by S. V. Cortelyou, Assistant State Highway Engineer who retired in 1949, and his successor, Paul O. Harding. Assisting in the work of administering and supervising the activities of the district are District Engineer E. T. Telford in charge of planning and design, and the writer in charge of construction and maintenance.

WALNUT CREEK PROJECT

The Division of Highways opened bids September 21 on a $3,000,000 freeway project in Contra Costa County in Walnut Creek for a length of 2.8 miles between Oakland Boulevard and 0.3 mile north of Monument.

The job calls for the construction of two 37-foot roadbeds with a 30-foot median to provide a four-lane divided freeway with frontage roads, ramps, and interchange lanes. There will be overcrossings at Waldon Road, Contra Costa Canal, Geary Road, Oak Park Boulevard and Hookston.

The low bidder was Stolte, Inc., and Gallagher & Burk, Inc., Oakland, with a proposal of $2,638,616.50.

Looking southeasterly along construction in progress on Santa Ana Freeway with the site of the Chapman Avenue Traffic Interchange System shown in center. Orange County Hospital buildings are shown center right.

Freeway Ramps

Proper Spacing Important In Preventing Accidents

By GEORGE M. WEBB, Traffic Engineer, and R. J. ISRAEL, Assistant Traffic Engineer

To PROPERLY locate a modern freeway and to establish its basic engineering features requires the careful consideration of many elements. A major factor is the over-all traffic service that any proposed freeway route will provide. In this connection, there is a direct relationship between the traffic service and the traffic interchange locations. Properly spaced points of ingress and egress must be carefully selected in order that the freeway will function with maximum efficiency and safety.

Traffic must be able to enter and leave the freeway at ramp connections smoothly and with as little friction as possible. To that end, ramp location and design must be coordinated to allow easy, unhurried merging and weaving maneuvers to take place. Experience has shown that certain minimum distances are needed between ramps if this is to be achieved.

Spacing Ramp Connections

Often local officials and groups ask that additional points of ingress or egress be created. In many cases, if this were to be done, the ramps would be too close together and the very purpose of the freeway—safe and efficient movement of traffic—would be seriously impaired. The same is true of similar requests by individuals who own or operate roadside business and who also ask for an off-ramp which would give direct access to their establishment.

The spacing of ramp connections cannot be based on an inflexible set of rules because of the complexity and the number of elements involved in the engineering decision at each location. The Division of Highways is constantly re-examining its planning and design practices for the purpose of evaluating and improving its present standards. Traffic studies so far completed point to the following general conclusions concerning ramp spacing in freeway design:

The Arden Way Off-ramp on the new Elvas Freeway near Sacramento effectively handles substantial volumes of traffic. One illuminated overhead sign and dual reflectorized advance signs precede the gore sign shown.

Ramps which serve a substantial volume of traffic without undue circuity of travel should be included if such ramps are sufficiently spaced to accommodate adequate geometric designs and to allow adequate advance signing. Ramps not justified from a traffic service standpoint should be omitted for the following reasons:

1. Ramp connections on high-volume freeways are the source of a substantial portion of total freeway accidents, and studies on such freeways show off-ramps to be three times as hazardous as on-ramps.

2. Studies show that "shopping from the freeway" is an accident generator.

3. Off-ramps must be sufficiently spaced to allow distance for adequate geometric design and advance signing. (Geometric design involves the length and curvature of interchange lanes, acceleration and deceleration lanes and adequate weaving distance between ramps.)

4. Traffic studies show that fewer accidents will result when minor intersections are eliminated and the movements combined at one location. Logic would indicate that this relation applies also to ramps.

1. ACCIDENTS AT RAMP CONNECTIONS

Accompanying *Table I* represents the summary of a two-year study of accidents on the heaviest traveled portions of the Pasadena (Route 165 portion) and the Hollywood Freeways. It shows that ramp accidents, which include the off and on movements, represent 33 percent and 25 percent, respectively, of the total accidents on these lengths of freeway. It also shows that off-ramp accidents are approximately three times as numerous as on-ramp accidents, while off-ramp fatal and injury accidents are nearly four times those involving on-ramps.

The summary also shows that ramp accidents are predominantly of the single-vehicle and two-car overtaking types. Basic causes are excessive speed, improper turning, and unsafe lane changes.

Table II shows the relation of ramp accidents to total accidents for a number of rural freeways. These rural freeways all show a significantly lower percentage of ramp accidents than do urban freeways. One factor is undoubtedly the wider spacing of ramp connections. The other factor is, of course, the traffic volumes. The table shows that the percentage of ramp accidents increases generally in

TABLE I

ACCIDENT STUDY ON THE PASADENA AND HOLLYWOOD FREEWAYS
LA-165-LA and LA-2-LA

	Pasadena Freeway — 1952 and 1953 — 4-level structure to Riverside Drive				Hollywood Freeway — 1952 and 1953 — Coronado Terrace to Spring Street			
	On ramp	Off ramp	Main frwy.	Total	On ramp	Off ramp	Main frwy.	Total
Total number of								
Accidents	17	44	123	184	17	46	183	246
Fatal accidents	0	1	2	3	0	1	2	3
Non-fatal accidents	5	21	48	74	6	19	89	114
Property damage	12	22	73	107	11	26	92	129
Fatalities	0	1	2	3	0	1	5	6
Persons injured	5	34	70	111	9	33	164	206
Daylight	8	14	44	66	10	19	114	143
Darkness	8	26	65	99	7	21	63	91
Clear (including cloudy)	14	34	100	148	15	39	171	225
Raining	2	5	6	13	1	0	7	8
Single vehicle accident	5	17	38	60	6	25	11	42
Two or more vehicle accident	12	27	85	124	11	20	172	203
Accidents involving trucks	0	0	9	9	1	4	20	25
Approaching	1	2	4	7	0	0	11	11
Overtaking	11	23	81	115	10	19	161	190
Intersection	0	2	0	2	1	1	0	2
Had been drinking	5	7	16	28	2	7	17	26
Sleepy (or apparently so)	0	1	3	4	0	1	4	5
Speed	3	15	21	39	5	18	11	34
Following too closely	2	3	32	37	3	5	81	89
Improper turning	2	17	1	20	1	0	1	2
Improper passing	5	0	8	13	4	3	11	18
Improper parking	1	1	4	6	0	0	8	8
Improper signaling	0	0	2	2	0	0	0	0
Wrong lane (not passing)	1	2	2	5	0	0	8	8
Skidding	0	0	0	0	0	0	3	3
Improper lane changes	1	6	39	46	3	14	52	69
Defective brakes	0	1	3	4	0	2	3	5
Tire trouble	1	1	5	7	0	1	4	5
Mechanical failure and out of gas	0	0	1	1	0	2	4	6

TABLE II

RAMP ACCIDENTS ON RURAL FREEWAYS

1/1/54 to 7/1/55	Tulare Tul-4-B, F	Sacramento Sac-3-B No. of North Sacramento connections	Bayshore SM-68-F	Eastshore Ala-69-C, D	Santa Ana LA-166-A Pioneer to to Atlantic	Totals
Accidents on						
On-ramp	1	2	4	16	10	33
Off-ramp	1	2	7	18	25	53
Entering on off-ramp					1	1
Leaving on on-ramp		1				1
Total ramp accidents	2	5	11	34	36	88
Total accidents on main freeway	34	44	61	167	224	530
Percent ramp accidents of all accidents	5.6	10.2	15.2	16.8	13.8	14.2
Number of traffic lanes	4	4	6	4	4	
1954 average daily traffic	10,000	30,000	51,000	38,000	60,500	
ADT per traffic lane	2,500	7,500	8,500	9,500	15,100	

proportion to the total volume of traffic on the freeway.

The table also shows there is no significant difference between the number of on-ramp and off-ramp accidents at the lower traffic volumes, but off-ramps become increasingly more hazardous as volumes increase. It is obvious that the problem of disengaging from a fast moving traffic stream becomes increasingly difficult as the density of traffic on the freeway increases.

2. SHOPPING FROM THE FREEWAY

Not too many years ago it was considered proper for the state highway to be located on the main business street, particularly through the moderate-sized and smaller communities. Businessmen were generally committed to the theory that the through traffic represented an essential business potential. Actually, mixing of the local shoppers with the faster moving through traffic invariably resulted in an extremely high accident rate for these lengths of highway.

In order to cure this accident situation and to expedite the flow of traffic, freeways were conceived and constructed. Accident-wise, the results have exceeded the most optimistic of expectations. Results, so far, generally show that in spite of the over-all increase in traffic induced by the new facility and the availability on Main Street for increased shoppers, the freeway and Main Street combined have less than half as many accidents as previously occurred on Main Street alone.

Business will naturally develop along the frontage roads which adjoin the freeway, and "roadside business" signs at the normal connections will direct traffic to the frontage road where the motorist can select restaurants, motels, or gas stations without the pressure of high-speed traffic. However, if off-ramps are constructed to directly serve specific business establishments, we are reverting to the old idea, and, to some extent, to the increased accidents attendant thereto.

So far there are no such conditions on full freeways, but direct connections to private businesses exist at many locations on our expressways. Studies at these access locations show that the condition which we have termed "shopping from the freeway" is a source of accidents. Accidents due to this condition involve sudden changed decisions on the part of one driver and appear as two-car accidents due to sudden slowing or sudden turning, including turns from the wrong lane.

3. REQUIRED SPACING FOR ADEQUATE GEOMETRIC DESIGN AND ADVANCE SIGNING

Present standards call for one-half to one mile advance signing on freeway turn-offs. There may be some doubt that this distance provides sufficient advance warning at present speeds. The eastern toll roads with wider spaced connections use far greater distances for advance signing. With the present trend of increasing speeds, it may be necessary to extend advance signing distance in the future. This advance warning is necessary to allow safe and orderly lane changes on the part of high-speed traffic.

Advance signing, as discussed above, is in addition to the length needed for the deceleration lane. The length of speed change lanes vary with the design speed of the freeway and the safe speed of exit as controlled by the ramp curvature. Maximum lengths under present design standards, including length of taper, are 300 feet for the deceleration lane and 1,050 feet for the acceleration lane. The length required for safe weaving, where an off-ramp follows an on-ramp, varies with the speed of traffic and the weaving volumes. The subject is too complex to state numerically in this article; however, a very considerable weaving length may be required for heavy volumes. Under normal conditions weaving length can be accommodated within required signing distance.

Although closer spacing will be required in cities to satisfactorily distribute the heavy volumes and to avoid circuity of travel, certainly off-ramps less than one mile apart on rural freeways will not allow room for required speed change lanes and adequate signing.

4. GREATER SPACING OF CONNECTIONS SHOULD REDUCE ACCIDENTS

Studies of intersections, both signalized and nonsignalized, show that intersections with low volume cross movements have more than their share of the accidents. That is, with a given number of cross movements, more accidents would be expected to occur if they were divided into two or more locations, than would occur if these movements were combined at a single intersection.

The Division of Highways has not yet made studies which would directly relate turning volumes to accidents at freeway ramps. One factor to support the hypothesis that ramp connections bear a relation to intersections is the lower percentage of ramp accidents on rural freeways. This is undoubtedly due, in some measure, to the wider spaced connections. There is also the factor that each additional off-ramp produces a grade intersection with the frontage road or the county road to which it connects. These low traffic intersections will generally develop more accidents than would the adding of these exit vehicles at the next major connection.

The department is manifestly justified in constructing major turn-offs to the highest standards, and in providing illumination and the most advanced signing, including bridge signs across the roadway. Such treatment is not economically justified at turn-offs to accommodate only a few vehicles per day, particularly in the matter of acquiring sufficient right of way to provide an adequate radius of curvature on the ramp.

California's full freeways are the safest system of highways in the world. It is necessary to be doubly vigilant to maintain this record with the extension of freeways for long rural distances. The department certainly cannot afford to introduce additional hazards in our design which studies so far indicate would be the net result of permitting intermediate connections which are not warranted from the traffic service standpoint.

Camarillo Study

Greatest Economic Gains Along Old Highway Route

By JOHN F. KELLY, Headquarters Right of Way Agent

One and a half years ago, US Highway 101 through Camarillo served a dual purpose as California's famous coast highway route extending from San Diego to San Francisco and as the main street of Camarillo. In addition to this conflicting mixture of fast moving through highway traffic and local shoppers, there was also the intersection at grade of State Highway Route 153 and a grade crossing of the main line of the Southern Pacific Railroad. The result was a highly dangerous traffic situation for everyone.

On March 24, 1954, this traffic tangle came to an abrupt end. Amid colorful civic ceremonies, Adolfo Camarillo, head of the family for whom the Town of Camarillo was named, cut the ribbon to officially open the new freeway through Camarillo.

This eventful day undoubtedly gave Don Adolfo Camarillo a great deal to think about. He would remember years ago when the town began with a few stores along US Highway 101 near the Southern Pacific Railroad main line crossing. He would be proud of the prosperous community which exists today and the part that he and other civic-minded citizens had played in making this town such a desirable place to live.

Aerial view showing freeway and old highway through center of Camarillo. Row of palm trees left of freeway indicates central portion of business district along old highway route.

SYNOPSIS

CAMARILLO		NEW FREEWAY		ECONOMIC STUDY	
Location	50 miles northwest of Los Angeles on US Highway 101 in Ventura County	Location	Near center of town	Purpose	Obtain factual evidence on the economic status of the community affected by freeway
Population	Estimated 5,000 (unincorporated)	Completed	March 24, 1954	Factual data	1. Property values 2. New building construction 3. Retail business condition 4. Community growth factors
Primary income	Agriculture	Design	Freeway with cross streets separated from through lanes Four-lane divided expressway permitting grade entrance at westerly end of town	Time of study	One year before and after freeway opened
Growth influence	Nearby government installations. Attractive residential sites	Property directly affected	Business district		

UPPER. Before freeway. Traffic on old highway route in business district. Congestion caused by railroad crossing

LOWER. After freeway. Traffic congestion relieved. Old highway route through business district being used for local traffic

Looking to the future on this day, Mr. Camarillo's thoughts were probably the same as all other citizens in the community in that he was certain the new freeway would relieve the hazardous traffic situation; but what would it do to the present economy and future growth of Camarillo?

Questions Involved

Resolving these doubts into specific questions, and then proceeding to obtain answers through the use of factual data was the problem posed for this study. Like many communities faced with the same group of doubts, the basic questions can be summarized as follows:

1. Would the relocation of US Highway 101 to another location decrease the value of property along the old highway route?

2. Would the rerouting of highway traffic to the new freeway put an end

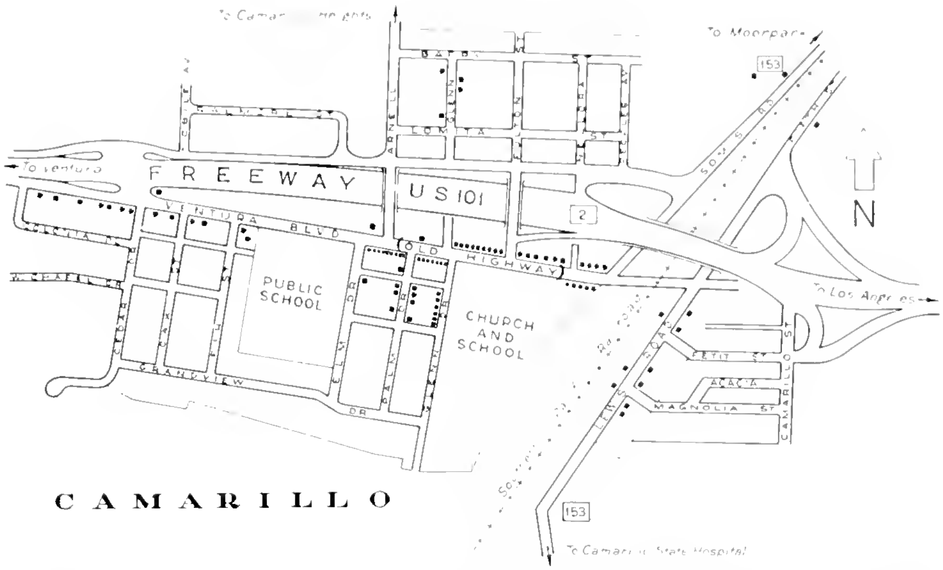


Diagram shows old highway and freeway through central portion of Camarillo. Note railroad and State Highway 153 crossing old highway route. The black squares indicate location of commercial buildings in the community.

to the new commercial building activity in the business district along the old highway?

3. Would the removal of highway traffic from the business district cause business losses which would affect the economy of the entire town?

4. Would the location of the freeway through the center of town divide the community, making the existing business district inaccessible to serve the entire town?

5. Would the freeway be a deterrent to future growth of the community and discourage prospective investors from choosing Camarillo as a location for a new home or business?

It then follows that if these questions can be answered, not by opinion, but by the application of known economic reaction of both land values and business activity to the freeway influence, the people of Camarillo can be certain of their future growth and economy.

Factual Study

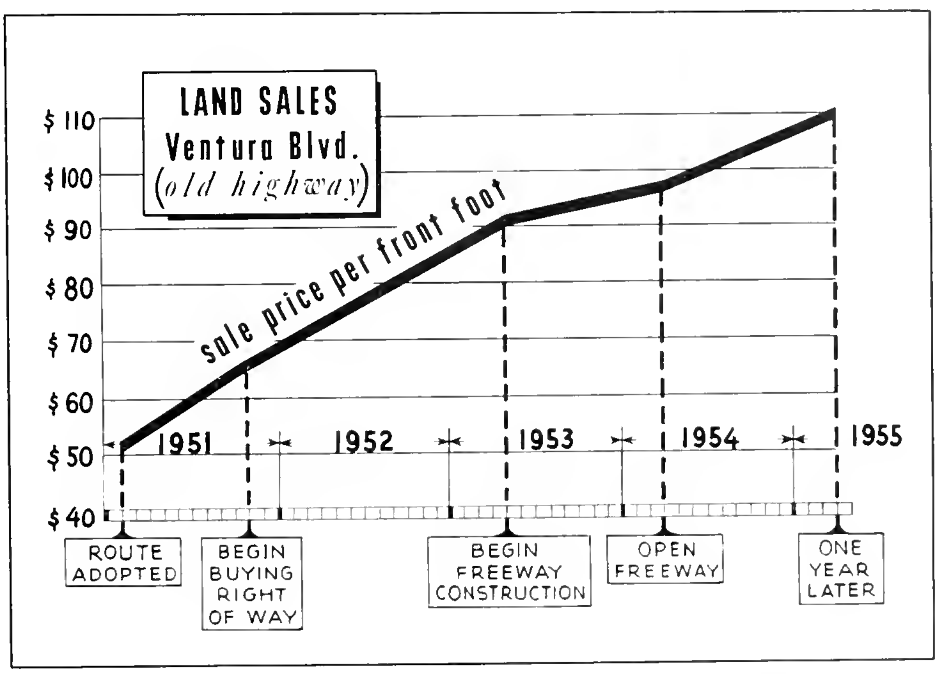
One of the first considerations in a study such as this is the determination of the length of time required to obtain a reasonable degree of accuracy. Generally the longest periods of time available for a study will give the highest degree of accuracy. In some communities the adjustment to the freeway mode of transportation is slow. In these cases, studies would not be warranted under two or three years after the freeway is in operation. Despite the fact that a relatively short time has elapsed since the completion of the freeway, ample evidence was found through a preliminary survey to indicate that Camarillo was not undergoing a long transition period in adjusting to the removal of through traffic from its business district. With adequate factual data available there was no reason to delay making an economic study just one year after the freeway opened. The Land Economic Section of the California Division of Highways, because of this almost immediate acceptance, proceeded to make a thorough investigation of all phases of the economy of Camarillo. The following material is the result of an analysis of the facts accumulated in this investigation and shows the present economic status of the community one year after the freeway was opened as compared with the previous year when the business district was along the highway route.

PROPERTY VALUES

One positive indicator of the freeway effect upon the economy of the community is the trend in property values, particularly the sale prices of those properties fronting on the superseded highway route. It is not always possible to have this data in an economic study because of an insufficient number of property sales in the community to definitely indicate a price trend before and after the construction of the freeway. Fortunately, there has been sufficient real estate activity along the old highway route in Camarillo so that this study will have the advantage of this vital information.

There are two methods of approach in utilizing the record of land sales.

Trend in land prices along old highway route during various stages in the development of the freeway



The first requires the use of all property sales and appraising the improvements included in the sale so that they can be subtracted from the entire sale price. The final result is the change in value attributable to the land only. The second method utilizes only the sales of unimproved properties, and thereby eliminates any question as to the amount of change in value to be assigned to the land. This method is obviously preferable and is the one used in this study.

Two fields of investigation were established for comparative purposes: first, the sales of property throughout Camarillo not directly affected by the freeway construction to establish the rate of change that could normally be expected; and secondly, those properties along the old highway where property was directly affected by the rerouting of traffic to the new freeway. All recorded sales or resales from 1946 to mid-1955 were investigated.

Trend on Old Highway

In general, it can be stated that all sales with frontage along the old highway maintained or exceeded the normal percentage of appreciation that could be anticipated, taking into account that the value increase in a growing community for commercial properties generally is at a more rapid rate than other types of land sales.

The accompanying chart shows the average land value of property along the old highway since 1946. The valuation of land at various stages during the development of the new freeway and during the year following its completion are indicated.

The trend in land sales prices from $36 to $110 per front foot, and particularly the increase that has taken place since the route for the freeway was adopted in 1951 would positively indicate that the freeway did not decrease the value of property fronting along the old highway.

Prior to 1945 commercial improvement along US Highway 101 in Camarillo was confined to approximately 25 building sites within a two-block area near the Southern Pacific Railroad crossing. The remainder of highway frontage through Camarillo comprised part of sizable land holdings and was not available for commercial building.

The accompanying diagram of Camarillo shows the location of the retail business district along the old highway.

In 1945 a subdivision with 18 commercial lots fronting on the highway between Glenn and Elm Streets was placed on the market. Two additional subdivisions west of Elm Street were opened in 1947 and 1949, making a combined total of 35 more lots along the highway for commercial improvement.

On March 24, 1954, when the freeway opened, there were 26 vacant subdivided lots fronting on the old highway zoned for commercial improvement. Fourteen of those lots, with frontage varying from 25 feet to 60 feet, have sold since the day through traffic was diverted from the old highway to the freeway. The sales prices of these 14 lots ranged from $95 to $214 per front foot or an average unit price of $110.

The sale of commercial frontage on side streets perpendicular to the old highway has been small in comparison with sales activity along the highway. The sales prices of these vacant properties have not shown as high a rate of price increase as was found for commercial lots fronting on the old highway after the completion of the freeway.

Taxation

The change in total taxation is a further indication of the increased property valuation and new building construction that has taken place in Camarillo since the freeway route was adopted.

The county taxes levied in Camarillo during the four-year period from 1951 to 1955 have increased from $63,684.37 to $103,078.08 per year, representing a 61.86 percent change.

The tabulation of county taxes was confined to the central area of Camarillo, as shown on the accompanying diagram. The Camarillo Heights District was excluded because it is not directly affected by the freeway.

NEW BUILDING CONSTRUCTION

The active real estate market along the old highway and particularly the upward trend in sale prices is indicative of the confidence many people have in the superseded highway route as a safe and desirable location to make an investment. This confidence is further emphasized by the fact that the majority of new commercial construction in the community has taken place along the old highway route. Since January, 1951, when it became definitely known that highway traffic would be rerouted to the freeway, 22 of the 29 new commercial structures in Camarillo were built along the route to be superseded.

The accompanying chart shows the number of new commercial structures along the old highway as compared with the number started on all of the streets of the town since January, 1951.

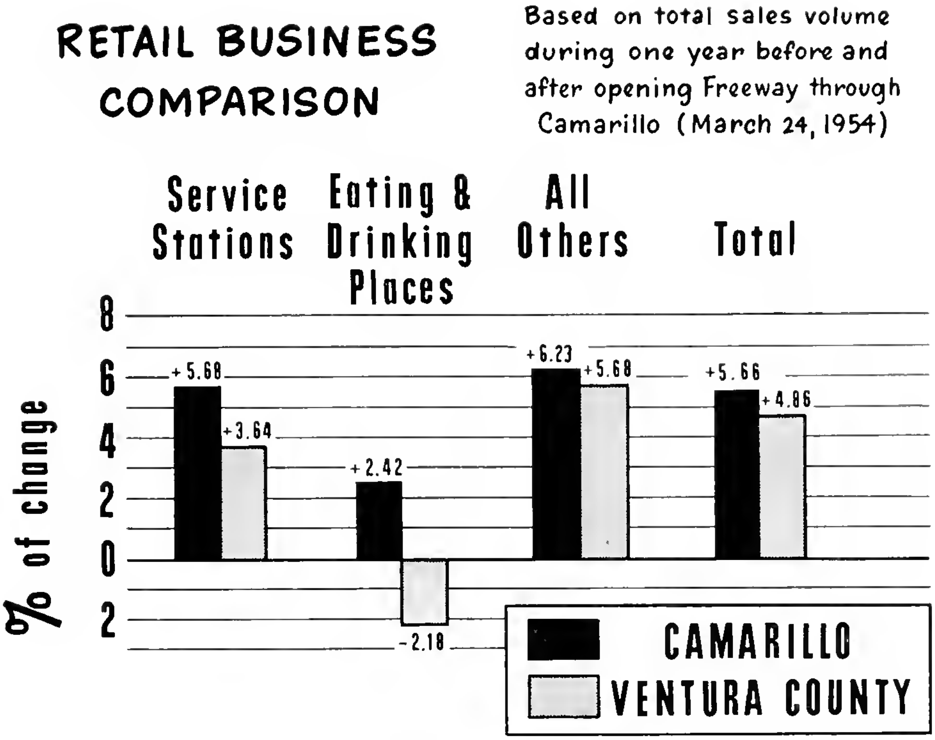
Building activity along the old highway route has not been confined to permits for new structures. Business growth has required expansion of a number of buildings, and permits have been issued for seven additions to existing structures since 1951.

The location of the school and church properties along the old highway route have caused the commercial improvements to be extended for some distance with wide separations between groups of retail outlets. The side streets of the three subdivisions opened in 1945, 1947 and 1949 provide the only opportunity to concentrate any sizable group of retail outlets in one specific area. This has been the principal incentive for building activity in that area. Regardless of the advantage of this centralized location, the commercial building trend and increase in land prices have been more spectacular along the old highway than on the side streets.

The reference to all other streets in Camarillo is not restricted to the three subdivisions. There are several other districts in the community which could have been developed into a new commercial area had there been any fear that frontage on the superseded highway would not remain the most desirable commercial site after the removal of highway traffic.

RETAIL BUSINESS

The factual data used for the retail business section of this study consisted of the gross retail sales reported by each retail outlet in Camarillo to the State Board of Equalization for the purpose of paying state sales tax. This



Graph illustrating percentage increase or decrease in volume of retail sales in Camarillo as compared with Ventura County during a similar period of time

source of information provided a reliable basis for making a comparison of business gains or losses before and after the freeway opened.

To ascertain whether the businesses in Camarillo were in line with the normal trend in business conditions, a comparison was made with all retail outlets in Ventura County during the same period of time.

This study is based upon a comparison of the gross retail sales in Camarillo and Ventura County during one year *before* and *after* March 24, 1954, the date the Camarillo Freeway opened. All of the retail outlets have been segregated into groups in order to distinguish between those businesses in the community most frequently patronized by highway motorists; such as service stations, eating and drinking places, and all other retail outlets which are dependent upon local patronage.

The graphic illustration in the accompanying chart shows the gains and losses by each group of businesses in Camarillo as compared with Ventura County before and after the completion of the freeway.

The dollars and cents figures in the tabulation of sales tax reports have been converted to percentages so that actual business volume of individual retail outlets would not be exposed.

According to the reports submitted to the State Board of Equalization, four new businesses were started in Camarillo during the year before the freeway opened. One of these new businesses was in the group catering to highway motorists; whereas, the other three were in the group unlikely to benefit from highway traffic in the business district.

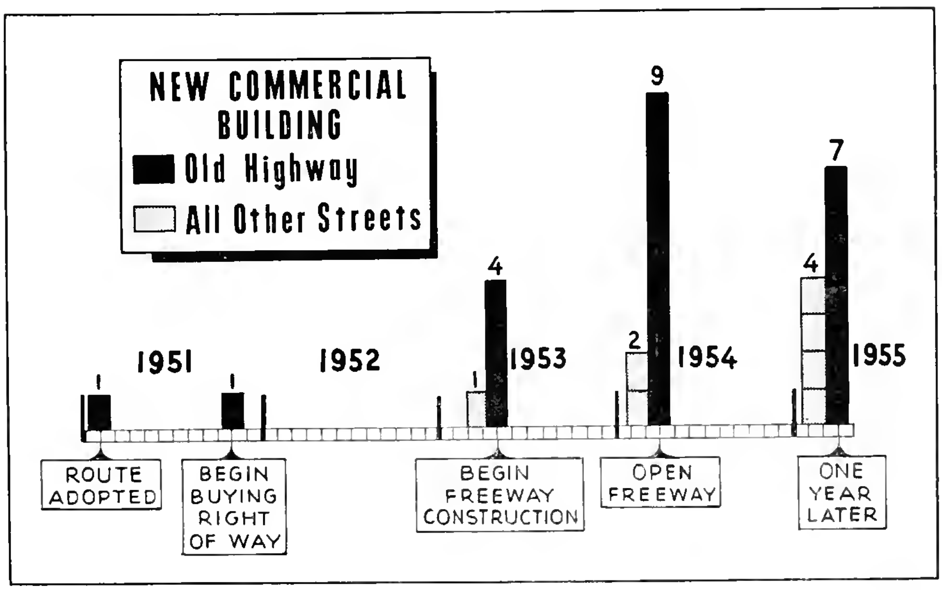
During the year "after" the records show 10 new businesses started in Camarillo. Five of these were in the category of service stations and eating and drinking places. Their location along the old highway route is an indication the investors did not feel that highway traffic at the front door was a requirement for success.

During the "before" period the records do not show any businesses closing out without a successor; whereas, during the year "after" there were two retail outlets in this category. Both of these businesses would be classified as a type dependent upon local patronage.

The total gross retail sales in Camarillo were 5.66 percent greater during the year after the freeway opened as compared with the year before. Total retail sales throughout Ventura County during this same period increased 4.86 percent. In other words, the economic condition of Camarillo from the standpoint of retail business was slightly higher than the increase required to attain equal status with the normal trend in business conditions in this general area.

The majority of retail outlets in Ventura County were subject to the same general economic influences and

A comparison of commercial building activity along old highway route and all other streets in Camarillo. Twenty-two of twenty-nine new commercial buildings constructed in community since 1951 have been along the old highway.



therefore had a relatively equal opportunity to succeed during the overall two-year time period covered by this study. In Camarillo the rerouting of the highway away from the business district represented a radical change from the traffic pattern to which the community had become accustomed. The merchants in Camarillo were required to adjust to this change in addition to the normal changes affecting business in other communities. Whatever adjustments may have been required to overcome this change were successfully accomplished within one year.

Service Stations

Service stations are one of the groups of businesses most likely to derive some benefit from highway traffic through the business district. The gross sales reports after the rerouting of highway traffic in Camarillo indicate that total service station business in the community was not deriving appreciable benefits from through highway traffic. The increase of 5.68 percent as compared with a 3.64 percent increase shown by all service stations throughout Ventura County reflects a substantial gain after the removal of highway traffic from the business district.

The community increase for service station receipts does not necessarily mean that each service station automatically shared in the community business increase. A tabulation of the gross retail sales of the individual service stations revealed that some of the stations suffered a business decrease during the year "after" while others enjoyed an increase in gross sales. The reason some of the stations suffered losses during a period when total sales in the community were increasing was due to local competition. Within two months after the freeway was completed two new major brand service stations opened on the old highway route in Camarillo. The volume of buisness they performed reduced the proportionate share of total business in the town for the existing stations.

Three of the existing major brand service stations located near the Southern Pacific Railroad depot in the older portion of the business district along the old highway route acquired new sites near the center of the business area (along the old highway route). Modern service station improvements were constructed on the new sites in order to compete for buisness increases taking place in the community.

Gasoline Sales

The total number of gallons of gasoline sold by all service stations in Camarillo during the period covered by this study has been obtained from the records of the oil companies and the State Board of Equalization. These figures reveal that after the freeway in Camarillo opened the total number of gallons of gasoline sold increased 4.73 percent over the previous year. This gain follows the state trend of 4.30 percent increase in gallonage sales in 1954-55 as compared with 1953-54.

During the "after" period the two new stations in Camarillo had a similar effect upon gallonage sales as upon the gross retail sales of the individual service stations. Despite the losses in gallonage sales among some of the service stations, the gain in total gallons sold in the community is further evidence that the rerouting of through traffic was not damaging to this type of business.

Eating and Drinking Places

The retail outlets selling food with nonalcoholic drinks, beer and wine, or all types of liquor, comprise the group of businesses referred to as eating and drinking places. Like service stations, these retail outlets are the types of businesses in the community that highway motorists are most likely to patronize.

The factual reports indicate that eating and drinking places in Camarillo were not relying very much on highway traffic for their success. The 2.42 percent *increase* for the year after the freeway opened compared with the 2.18 percent *decrease* for the same type of retail outlets throughout Ventura County shows the benefit of the freeway to this business group.

If the owners of these businesses had elected to cater primarily to the passing motorist rather than building up a good repeat business among local customers, the effect of rerouting highway traffic from the business district to the freeway would have undoubtedly reflected a different trend in gross sales.

Where income is primarily dependent upon the merits of good business management as evidenced by service, quality merchandise, etc., the removal of through traffic and congestion is a district benefit. The gains made by eating and drinking places during the year after the freeway opened in Camarillo discredits any assumption that the removal of highway traffic from a business district is ruinous to this particular type of business.

All Other Business

The majority of the retail outlets in Camarillo, such as grocery, hardware, clothing stores, etc., comprise the "all other" group. The tabulation of gross retail sales shows a 6.23 percent increase for this group after the freeway opened as compared with the year before. The same type of businesses throughout Ventura County gained 5.68 percent during the same comparative period. The gains made by the "all other" group of businesses in Camarillo were not as spectacular as those made by service stations and eating and drinking places, but were well above the normal expectancy during this period.

TRAFFIC

Before the freeway was completed, a total of 8,250 vehicles per day used the old highway route through the business district of Camarillo. Local traffic comprised only 1,210 of these vehicles.

The removal of approximately 7,050 through highway travelers from the main street of Camarillo made the retail outlets along the highway more desirable to the local shoppers because of better parking facilities and safer traffic conditions for motorists and pedestrians.

COMMUNITY GROWTH FACTORS

This study has shown the effect of the new freeway upon the economy of Camarillo through such positive indicators as property values, new building construction and business conditions in the community. The primary purpose of this study has been to determine the freeway effect upon the economy of the community; however, an economic analysis of Camarillo

View of business district along old highway route. Many of the commercial structures visible have been built since freeway route adopted.

would not be complete without consideration being given to all of the factors influencing its economy.

Government Installations

The geographic, climatic, and physical conditions of the area surrounding Camarillo have made it a popular place for the construction of various government installations. The close proximity of Camarillo to these government facilities with their large pay rolls and job opportunities has had a marked effect upon the growth of the community in recent years.

The oldest and best know of these government installations is the Camarillo State Hospital, located less than five miles from town. This large mental institution opened in 1936 and at the present time has approximately 1,600 employees. Approximately 200 of the employees live in the Camarillo area. The expenditures made in Camarillo from the $5,500,000 annual pay roll, plus the money spent in the community by visitors to the hospital, have a substantial effect upon the economy.

The Oxnard Air Force Base located approximately two miles west of Camarillo is the government installation situated closest to the town. At the present time, there is a total of approximately 1,950 civilian employees and military personnel at this air force base. According to latest reports from the air force base, an additional squadron and other manpower increases are anticipated in the near future. Approximately 316 of the present personnel live off the base and an indefinite number of these people are residing in Camarillo.

The U. S. Naval Air Missile Test Center at Point Mugu near Highway 101 alternate contributes additional pay roll expenditures in the Camarillo area. At the present time, there are an estimated 4,500 military personnel and civilian employees at this installation. An estimated 450 people live in the Camarillo area.

The U. S. Naval Advanced Base depot at Port Hueneme is located approximately 11 miles from Camarillo. An estimated 228 of the 3,800 civilian and military personnel at the depot live in Camarillo.

Attractive Residential Sites

The climatic conditions and country living atmosphere at Camarillo have attracted a number of residents, particularly in the Camarillo Heights area. Camarillo enjoys a convenient location, being situated approximately half way between Los Angeles and Santa Barbara, and a relatively short distance from Oxnard and Ventura. Completion of the freeway through Camarillo links the community by a modern highway system with these urban centers. The reduction in driving time is expected to make Camarillo more popular than ever as a residential community.

At the time this study is being written, a subdivision of 78 homes ranging from $12,000 to $15,000 is planned for construction adjacent to the frontage road south of the freeway and west of the business district. Other plans for residential and commercial building in the community indicate that Camarillo will grow considerably in the near future.

CONCLUSIONS

In summarizing this economic study, these conclusions can be made:

1. The relocation of US Highway 101 to another location did not decrease the value of property along the old highway route. This property frontage increased at a higher rate than similar property elsewhere in the community.

2. The rerouting of highway traffic to the freeway did not put an end to new commercial building along the old highway. New construction on the superseded highway has had all the characteristics of a building boom.

3. The freeway benefited retail business to the extent that every type of business in the community showed a substantial increase after the removal

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Burns Freeway

Second Unit of Project Is Dedicated by Governor Knight

By ALAN S. HART, District Engineer

The memory of Assemblyman Michael "Mike" J. Burns coauthor of the 1947 Collier-Burns Act will be perpetuated and a long-felt need of his home area fulfilled with the completion and dedication of the second unit of the Burns Freeway. The Burns Freeway is the portion of US Route 101 between the northerly city limits of Eureka and north city limits of Arcata and officially designated the Michael J. Burns Memorial Freeway by House Resolution No. 230 passed on June 15, 1949. The first unit, completed in 1954 and dedicated on July 20, 1954, extended from Gannon Slough just south of Arcata through Arcata and to a point just north of north city limits of Arcata, a distance of approximately 2.9 miles.

This second unit, known as the Eureka Slough-Gannon Slough project, extends from Eureka Slough at northerly city limits of Eureka to Gannon Slough for a length of approximately five miles.

The project is a unit of planned highway development from south city limits of Eureka to the US 101-299 intersection north of Arcata, and was first contemplated in 1944 when placed on the planning program as a high-priority project, but execution was dependent upon availability of funds to finance.

The completion of the freeway fulfills a long-felt need in the matter of highway improvement in the Humboldt Bay area wherein traffic volumes, continually increasing from year to year, overtaxed the old two-lane facility with resultant severe traffic congestion and delays. The sector of highway gains in importance wherein it serves as the major artery in the Humboldt Bay metropolitan area, the most densely populated area in extreme Northwestern California. It is a prime example of a section of highway that is not only a portion of a main route carrying long-distance through traffic, but is also of vital importance to the local transportation needs, especially a "Main Street" between the Cities of Eureka and Arcata, which are closely related in the daily activities of the area.

This improved highway facility supersedes the old two-lane highway, which was paralleled by new northbound lanes, and the old two-lane road was reconstructed to accommodate southbound lanes. The old highway was originally graded in 1918, gravel surfaced in 1921 and provided with a concrete pavement in 1925.

Work on this second and final unit of the Burns Freeway was accomplished under two contracts, with work starting on May 1, 1954. The first contract included grading and structures, including new bridges across Jacoby Creek and Gannon Slough and widening of the old structures across these waterways. Work under the first contract was done as a joint venture contract by Macco, Morrison-Knudsen, and River Construction Company at an approximate cost of $868,000. The second contract provided final surfacing and lighting at intersections with work done by the Mercer, Fraser Company of Eureka at an approximate cost of $633,200. Costs of rights of way will approximate $306,000. Total construction cost is approximately $1,807,200.

The completion of the project provides a four-lane limited-access freeway with channelized intersections at the two county road intersections, the connection serving the Humboldt County Airport, and a frontage road serving an industrial area.

The project traverses the westerly edge of a reclaimed tidal flat adjoining Humboldt Bay with the only promontory being a finger of the foothills extending to the bay where the highway and adjoining Northwestern Pacific Railroad pass through a cut, which came to be known as Brainard Cut.

On the west side and southerly side of the freeway as it curves around the northerly reaches of Humboldt Bay the highway is paralleled by the Northwestern Pacific Railroad. The tidal flat is therefore protected from inundation by the railroad and highway embankments supplemented by reclamation dikes and drainage ditches.

The alignment of the old highway was utilized which met all the required design standards, being generally long tangents connected by long-radius curves. Terrain allowed provision of flat grade but broken grades were utilized to provide proper drainage.

The typical roadway section is a four-lane divided highway with 37-foot-wide all-paved roadways separated by a 70-foot-wide median strip. The all-paved roadways provide two 12-foot driving lanes with 5-foot inside shoulders and 8-foot outside shoulders.

The structural features of the section on the northbound lanes on the new grade consist of 0.33-foot Class "C" cement treatment (4 percent cement) of the subgrade material overlain by 0.50-foot of Class "A" cement-treated base. The cement-treated base is 25 feet wide with untreated base shoulders.

The southbound lanes (the old two-lane concrete pavement) were reconstructed to provide a minimum of 0.33 feet of untreated base and existing shoulders were widened and reinforced with a minimum depth of 1 foot of imported borrow.

On both roadways the wearing surface consists of full-width 0.2-foot depth of dense graded plant-mixed surfacing with 0.05-foot open graded plant-mixed surfacing on the traffic lanes and a fog seal on the shoulder areas.

The project includes approximately 4,100 feet of frontage road serving industrial development just northerly of

. . . Continued on page 26

Memory of Late Michael J. Burns Honored by Knight

Several hundred people from Eureka, Arcata, and the surrounding country joined together in a ceremony opening the M. J. Burns Memorial Freeway on Thursday, July 22, 1955. Mrs. Michael J. Burns, assisted by Senator Randolph Collier, snipped the blue and gold ribbons which permitted the flow of traffic between the two Humboldt cities.

Humboldt County turned out generously to greet Goodwin J. Knight, the first Governor to visit them in years. The Governor's gracious wife, Mrs. Virginia Knight, was an instant "hit" with both the women and the men of the area.

No longer now will the motorists move bumper to bumper on the strip between Eureka and Arcata. Caught as they often were behind huge logging trucks, the tourists moved with a snail-like pace. The new freeway now voids this unpleasantness.

The dedication and official opening of the freeway was a joint venture of the Eureka and Humboldt County Chambers of Commerce.

Guests of Honor

Master of ceremonies, A. J. Gosselin, Chairman of the Eureka Chamber of Commerce Streets and Highway Committee, presented the visiting guests upon the speakers' stand. They included: Frank B. Durkee, Director of Public Works and Chairman of the California State Highway Commission; F. Walter Sandelin, Ukiah Commissioner; Chester H. Warlow, Fresno Commissioner; James A. Guthrie, Vice Chairman, San Bernardino Commissioner; Chelso Maghetti, Secretary, Davis; F. W. Panhorst, Assistant State Highway Engineer; Milton Harris, Construction Engineer; Mayor A. B. C. Davis, Arcata; Mayor George C. Jacobs, Eureka; Sam B. Merryman, Jr., District No. 5, representing Humboldt County Board of Supervisors; contractors: Ralph Brown, Mercer Fraser Company, Eureka; Macco Corporation, M & K Company, River Construction Co.; Senator Arthur W. Way, Third District; Assemblyman Frank P. Belotti, First District; A. S. Hart, First District Highway Engineer; George J. Cole, Chairman, Humboldt County Chamber of Commerce; Lloyd Height, President, Arcata Chamber of Commerce; Cliff Dunm, President, Eureka Chamber of Commerce; Mrs. Michael J. Burns, widow of the late Senator Mike Burns; Sena-

UPPER—Governor Goodwin J. Knight, left, and Senator Randolph Collier hold sign which was installed on new freeway. In center—Mrs. Michael J. Burns, left, and Mrs. Knight, right. LOWER—Photo taken of scene of ribbon cutting.

tor Randolph Collier, Second District, Yreka; and Mrs. Goodwin J. Knight.

Eight Miles of Modern Highway

The address of the afternoon was made by Governor Knight. He said in part:

"The project that we are dedicating here today is a unit of the Burns Memorial Freeway, more than five miles in length, and costing more than $2,000,000. Together with the first unit, which was completed in July last year through Arcata, it will create eight miles of ultramodern highway, built at a cost of more than $5,000,000.

"New highways such as the one we are dedicating today mean much to our travelers, not only in faster movement and greater comfort, but in added safety.

"Expressways and freeways seem to be today's answer to the terrible toll that is being exacted on our highways. The records show that freeways are about four times as safe as travel on two-lane highways. Expressways are next in the safety category, with three-lane highways almost as dangerous as the two-lane roads.

"As costly as they are, we must continue to build bigger and better expressways and freeways for our people. This Burns Memorial Freeway is a fine example of what the State is endeavoring to do in the way of providing the most modern forms of highways for the people of California."

Tribute to Michael Burns

"It is particularly fitting for this project to be named the Burns Memorial Freeway. Senator Michael J. Burns, co-author of the Collier-Burns Highway Act for the development of an expanded state system of roads and highways, truly can be said to be one of the fathers of California's modern network of fine highways. Senator Burns died in 1947, after 17 years of notable service to the people of California in our State Assembly and our State Senate. No more suitable memorial could have been devised for this sunny son of Ireland who contributed so much to California's progress. He truly was a man independent in spirit, constant in his concern for the public welfare, and a man who strictly adhered to the principles that have made our Country great. His name will live long in the memory of those with whom he worked for so many years in our State Capitol in Sacramento, and in the hearts of the people here among whom he lived."

Following the ceremonies, the Governor, members of the Highway Commission and prominent officials of Humboldt County were guests at the beach home of Mr. R. W. Mathews.

Preceding the events of the afternoon the visitors were guests for lunch in the famous Carson Mansion, an outstanding structure in architecture.

In the evening, under the auspices of the Eureka Chamber of Commerce, the Governor addressed one of the largest dinner groups ever assembled in the Eureka Inn.

C. A. Maghetti, Secretary
State Highway Commission

BURNS FREEWAY

Continued from page 24 . . .

Eureka Slough. This road was constructed to a 40-foot width between curbs with a plant-mixed surfacing on a 0.3-foot depth of Class "A" cement-treated base. To fence off the frontage road from the freeway a 72-inch link fence was placed.

Major structure work involved bridges over Jacoby Creek and Gannon Slough. At Jacoby Creek the old bridge was widened to 37 feet and a new parallel bridge of the same width was constructed. At Gannon Slough the old bridge, 360 feet in length, was widened to 28 feet and a new parallel bridge 77 feet in length and 37 feet wide was provided. Two large box culverts in drainage ditches were reconstructed and extended and new floodgates provided.

"Borrow Job"

The prevalence of the unsuitable material composing the marshland adjacent to the new bridges made it impossible to recompact and necessitated surcharge of the approach embankments prior to bridge construction to obtain maximum possible consolidation of the underlying marsh muck.

The project traversing the flat marshland, with no appreciable satisfactory material developed in excavation, was a "borrow job." The knoll at Brainard Cut was almost leveled to provide the material for embankments, and approximately one-half million yards were removed and utilized.

To maintain the drainage of the tidal flat, the existing drainage plan had to be perpetuated. The old drainage ditch paralleling the old highway was reconstructed to the right of the new northbound lanes, and the material excavated, which was unsuitable for embankments, was used to fill the old ditch and form the freeway median strip. This material will eventually subside and compact and the width of the median then provides for construction of possible future necessary driving lanes.

Under right-of-way agreements the State is obligated to maintain drainage ditches, and such maintenance in the past proved to be somewhat of a problem by reason of the growth of tules, cattails, etc., which seriously decreased the discharge capacity of the ditches. To alleviate this problem and keep future maintenance costs down, modern chemistry was utilized on this project. The surfacing contract included an item of weed control treatment. The ditch areas were sprayed with a solution of 80 percent 3-(3,4 dichlorophenyl)-1-1-dimethylurea. It is anticipated that this treatment will control weed growth with another lesser application of same material in about a year, with a similar application every two or three years thereafter.

Highway lighting at the two main county road intersections, namely, Indianola Road and Bayside Cutoff, consists of the newly developed fluorescent highway lighting fixtures, first installation of which was made on the previously constructed Arcata portion of the Burns Freeway, have proven to be very satisfactory.

Harold "Hod" W. Benedict was resident engineer on both the grading and surfacing projects under the general direction of Alan S. Hart, District Engineer. The Bridge Department was represented on the project by Alton Kay, who handled the major structure work.

Fresno Freeway

Will Provide Many Benefits To Through and Local Traffic

By EARL T. SCOTT, District Engineer, District VI

FRESNO CITY'S first full freeway now under construction is fast taking form. Comprising a section of US 99, mostly on new location and having a length of six miles, the freeway will extend from Church Avenue, the south city limits, northwesterly through the city and on to Princeton Avenue. The new section of US 99 will parallel to some extent the existing highway but will follow a route through Fresno along the westerly side of the Southern Pacific Railroad tracks.

The first major contract was awarded to Guy F. Atkinson Company, South San Francisco, in August, 1954, and is now just about complete. The job was 2.4 miles long extending from Tielman Avenue to Princeton Avenue and cost $1,510,000, not including the cost of right of way. A second contract 1.8 miles in length and extending southerly from Tielman Avenue to San Joaquin Street was awarded to Gene Richards, Incorporated, and D. M. Underdown and Gene Richards of Fresno, and has been under way since July of 1955. The cost of this most recent job will be about $1,545,000. The final contract to be let to complete the freeway through Fresno will be advertised early in 1956.

Eleven Structures

Contracts now under way provide for the construction of an underpass at the Kerman Branch of the Southern Pacific Railroad and an overhead crossing of the Southern Pacific main line tracks at Clinton Avenue, as well as nine undercrossing or overcrossing structures at intersecting streets or roads. The work on these structures together with grading and paving operations is confined to a section of freeway of about 3¾ miles in length. With two contractors at work an with their equipment everywhere, many people observe the progress being made. They are fast becoming freeway conscious and are looking forward to the completion of the job.

Looking north on Fresno Freeway, showing construction

Present Route Inadequate

Present US 99 through Fresno has little to recommend it as a satisfactory route. The 5¾-mile section, to be superseded by the freeway, contains almost every possible factor to endanger and impede the flow of its 21,000 to 30,000 daily users.

It has four abrupt changes in direction at busy intersections where drivers often lose their way. The 15 traffic signals contribute to our excessive number of rear-end accidents and often delay traffic.

It traverses over a mile of downtown shopping area, with many turning movements, swarms of pedestrians and heavy parking, and an additional two miles of fringe area business

This aerial view of the Fresno Freeway shows the progress made to date on the new route which will bypass Fresno. The photograph is looking south from a point over Princeton Avenue.

district and roadside development. Nearly five miles has restricted speed zoning, much of it at 25 miles per hour. A section of three-lane pavement still remains.

An accident rate several times the state average has long persisted, the current rate on one long section being 26 accidents per million vehicle miles.

When the freeway is completed, 7,000 through vehicles a day and additional thousands of local users will benefit markedly from its greater safety, increased mobility and more comfortable qualities.

The time needed to drive through Fresno will be cut in half. The accident rate should drop to approximately 1.4, the average for all California freeways. Driving strain and discomfort will be at a minimum.

But its benefits will not be confined to those who use it. The reduction in traffic on the present route will aid the thousands of local drivers who continue to use that facility. Further, due to an inevitable readjustment of traffic in the downtown area, not only Broadway but at least four other streets parallel and adjacent to it will feel the effect of lessened congestion.

Thus, the Fresno Freeway and the three pairs of one-way streets soon to be put into use on two other state highways, will provide Fresnans with a rapid and safe network of state highways for traffic to pass through, around, or into the central business district, as well as important side effects on many other city arterials.

FROM MANILA

The Editor Sta. Ana, Manila

SIR: I have been receiving regularly issues of your *California Highways and Public Works* magazine for the last four years, but I never did have the occasion to thank you for the privilege of being included on your mailing list. I am now taking the opportunity to do so.

I have found all the issues very interesting and very helpful to our work in the City Engineer's Office of Manila. The change in cover to color made it more attractive and more worth keeping.

Sincerely yours,

M. C. GOMEZ

FREEWAYS DELICATELY ATTUNED

The Nation's giant freeways are proving something that few foresaw when these marvels of speed, interchange and confusion were conceived.

What they are proving is that freeways are among the engineer's most delicately adjusted devices.

They well might be compared to a highly jeweled watch, a fine internal combustion engine or a television instrument.

Each is the result of ingenuity expended over a long period of years.

Each is composed of an infinite number of parts, many of them so tiny as to appear unnecessary.

But they all are necessary. If there be any doubt, just bend a minute cog on a watch sprocket or remove a screw from a carburetor.

Freeways first are images in the minds of men.

These images are transferred to the draftman's sketches.

Distances are calculated to a fraction of an inch.

Designs estimate the speed cars may travel with safety. They include the number of cars expected to use specific sections of the freeway, and of the cars which will leave or enter the freeway lanes by way of ramps.

Where possible, as on San Diego's fine Cabrillo Freeway, the effects of natural beauty upon the motorist are considered.

And the results of all this planning are magnificent. They speed traffic smoothly and without irritation. They do until * * * some motorist does something that could not have been foreseen.

Something like entering the freeway without caution. Or something like changing lanes without proper signals, or speeding, or going too slowly.

Then there is a crash, and within seconds the fine freeway becomes an infernal trap which backs up fuming motorists for miles.

In a manner of speaking, a cog got bent or a screw became lost in this fine mechanism.

Freeways can be no better than the drivers who use them, but they can be just as good, or just as bad.—*Editorial from San Diego Evening Tribune.*

CONSTRUCTION PROJECTS IN LOUISIANA

By NORMAN C. RAAB, Projects Engineer, Division of San Francisco Bay Toll Crossings

Recently it was the privilege of the writer to make a trip to New Orleans, Louisiana, for the purpose of inspecting the construction of two major projects in that area. These projects are the offshore oil drilling developments in the Gulf of Mexico and the 24-mile prestressed concrete highway bridge over Lake Pontchartrain.

Certain aspects of the construction of the above two projects are similar in detail to those used in the planning for the approach to the Richmond-San Rafael Bridge on the Marin County side and for the greater part of the transbay structure of the Southern Crossing of San Francisco, as they have required the precasting of concrete elements used in the structure, then transporting and erecting these parts in rough water.

The construction of the Lake Pontchartrain Bridge consists of the prefabrication of hollow poststressed concrete piles, which are 54 inches in diameter, driven and jetted into accurate position along the line of construction; the positioning of a precast concrete cap on the tops of the two pile bents; and the placing, by waterborne equipment, of the 180-ton prefabricated and pretensioned roadway section on the newly constructed bents. The roadway is 28 feet in width and provides two lanes, each 14 feet wide, permitting two-way traffic past a stalled vehicle.

John Dahlquist

John Dahlquist, senior construction supervisor for the Division of Architecture retired from state service recently and was honored by fellow employees at a retirement dinner held at the Turf Club in Rivera on August 17, 1955.

Dahlquist was born in Stockholm, Sweden, on October 12, 1885. He was a graduate of the Higher Technical College of Stockholm in civil and structural engineering. Following his graduation he worked in many of the construction trades as well as for his father who was a contractor. For a period of time, he acted as foreman and superintendent of construction for several contractors, but in 1919 strike conditions forced him to leave Sweden and he came to the United States where two brothers and a sister were living.

He arrived in New York in 1920 and first went to Chicago. He later went to Minneapolis where he accepted a job as construction supervisor with Engstrom and Lingwall Construction Company supervising the construction of a housing project. In 1921 he went to Seattle and then to San Francisco. In San Francisco he was employed for a time as superintendent for the Walmark Construction Company. The next year he opened a structural engineers office in the Wright and Collander Building in Los Angeles and for over a year practiced his profession of engineering. In 1923 he joined the Pozzo Construction Company as general superintendent. He married Helene Hendrickson at Santa Ana in Orange County on August 27, 1926.

For the next 20 years Dahlquist worked for different contracting firms, the City of Los Angeles and for himself as general contractor. In 1948 he joined the forces of the Division of Architecture as a senior construction supervisor and was placed in charge of direct construction work at the Department of Agriculture Poultry Laboratory in San Gabriel. For several years he was construction supervisor of several National Guard armory projects in Southern California, and from December, 1953, until the date of his retirement was in charge of construction at the Long Beach State College.

Employees Receive Twenty-five-year Awards

Employees of the Division of Highways who became eligible for 25-year awards during August and September, 1955, are:

Name	Total service Yrs.	Mos.	Days
ELIGIBLE ON JULY 31, 1955			
District VII			
Jones, Edward P.	25	0	29
ELIGIBLE ON AUGUST 31, 1955			
District II			
Nett, Walter M.	25	0	9
District IV			
Brown, Elmer	25	0	21
District V			
Holman, Herbert J.	25	0	22
Lovell, Mabel A.	25	0	9
District VII			
Dewing, Earle H	25	0	24
District VIII			
Gaylord, C. Worth	25	0	8
McCurry, Richard C	25	0	25
District XI			
Gray, George A	25	0	25
Central Office			
Fulton, Rex H.	25	0	19
Bridge Department			
Gillenwaters, Franklin G.	25	0	22
Shop 1			
Tharp, Charles H., Jr	25	0	2

Name	Total service Yrs.	Mos.	Days
ELIGIBLE ON SEPTEMBER 30, 1955			
District II			
Dooley, Ambrose J.	25	0	22
Eugene, Joseph K.	25	0	27
District III			
Ambler, Arthur N.	25	0	21
District IV			
Miller, Lawrence V.	25	0	16
Wise, M. S.	25	0	21
District V			
Chittenden, Carroll S.	25	0	16
District VI			
Landers, Joseph T	25	0	28
District VII			
Curtis, Cyril W.	25	0	16
Leidel, Walter L.	25	0	28
District VIII			
Taylor, Cleveland C.	25	0	0
District XI			
Hopkins, A. E.	25	0	22
Central Office			
Ferron, Harold L.	25	0	18
Bridge Department			
Brownell, Clarence J.	25	0	12
Materials & Research			
Scholefield, Howard L.	25	0	15
Shop 6			
Kent, Charles	25	0	20

CAMARILLO STUDY

Continued from page 23 . . .

of highway traffic from the business district.

4. The location of the freeway through the center of town did not divide the community or make the existing business district inaccessible to any particular area. The spectacular growth in the existing business district supplies the answer to this question.

5. The freeway has not discouraged new investments in the community. Building activity since the completion of the freeway and proposed construction indicates that Camarillo is just beginning to grow.

CARRIAGE MEN DISBAND

The four surviving members of the Carriage Wagon Woodstock Implement Association have decided that, after 75 years, the organization might just as well disband, reports the National Automobile Club.

"We're gone—we've just got to face the truth," said F. F. Stice of Fayetteville, Arkansas, as he proposed the deactivation.

"We're down to four. Besides the gas engine, now we've got this stuff about flying saucers, jets, and the atomic and hydrogen age. No, boys, we're on the way out."

D. B. Campbell of Tullahoma, Tennessee; C. B. Marquis of Fort Smith, Arkansas; and J. R. Tubb III, of Sparta, Tennessee, listened to the dismal truth and agreed that the carriage trade was gone—real gone.

First Classified Scenic Area Is Established By Forest Service

Clare Hendee, acting under his authority as regional forester of the U. S. Forest Service in California, has established, with the concurrence of the Chief of the Forest Service, a special area dedicated to scenic recreation in Tuolumne County to be known as the Calaveras Memorial Scenic Area. This is the first such dedication of national forest lands in California to be administered for the exclusive purpose of preserving scenic recreational values.

This memorial scenic area consists of 378.7 acres of the finest stand of veteran sugar pines remaining in the State. Intermingled are the associated pines, firs, and cedars and a few giant sequoias that make up the typical virgin forest in this part of the Sierra. This area adjacent to the Calaveras South Grove Big Tree State Park will greately enhance the recreational values and attractions of the whole area.

Under forest service administration this area will be maintained in an undisturbed condition, no commodity sales will be made and the only development permitted will be a minimum of foot trails to enable the public to reach and enjoy all parts of the area. Only in case of a disastrous fire or uncontrollable epidemic insect attack will the removal or salvage of the killed trees be authorized.

PASSENGER CAR-TRAILER ACCIDENTS

Passenger car-trailer combinations were involved in 828 California traffic accidents during 1954, reports the National Automobile Club.

HIGHWAYS BENEFIT

Prior to construction of the Eastshore Freeway connecting Oakland and San Jose, average land values in the area were about $500 an acre. Today, according to the National Automobile Club, the property in that same vicinity is valued at $21,000 an acre and $40,000 an acre valuation for land fronting the highway.

NOTHING FAZES A FISHERMAN

Bakersfield, California
September 10, 1955

California Highways and Public Works

Gentlemen: I have just reviewed a copy of your magazine of July-August and note, with regret, the announcement of the passing of Robert C. McFarland, construction superintendent.

Immediately this took me back some 20 years when the road into King's Canyon was being built. A fishing buddy of mine and I had been in the habit of going into this country, on foot, for a long time. When we arrived that year we found the road was under construction with this area closed to the public on account of a job of blasting. Having traveled a long distance, we were naturally highly disappointed and with the fisherman's usual ingenuity, when his sport is being denied, I spoke up and said: "Well, it's too bad; my brother, who is in charge here, is at the other end of the road or I am sure he would let us through."

After looking at my driver's license, the hard-boiled guard softened and said: "Oh, all right fellows, we'll tell McFarland he missed you—go on through, but be careful." Later we met up with McFarland and he showed a fine sense of humor saying that he wanted to see the "bird" who was his brother. He even gave my pal a lift since he had given out coming over the hill. This incident occurred in the vicinity of Horseshoe Bend.

Yours very truly,

A. H. McFarland

THE RIGHT SIDE

Who's a pedestrian? You are the moment you step from your car. Always leave your car from the curb side, says the California State Automobile Association, never from the street side.

SAFETY MARGIN

It's the driver, not the car or the condition of the road, who causes most of the accidents. A good driver allows an adequate margin of safety between his car and the others.

CLARE HENDEE NAMED ASSISTANT CHIEF OF FOREST SERVICE

Regional Forester Clare Hendee, who has been in charge of the California region since 1951, has been named an assistant chief of the forest service by its chief, Richard E. McArdle, the U. S. Department of Agriculture announced. Hendee succeeds E. W. Loveridge, who has retired from the forest service to accept an assignment as agricultural attache with the American embassy in Bogotá, Colombia.

In assuming his new position Hendee will head up the administrative management and information activities of the forest service. Hendee will direct and coordinate administrative operations, personnel, organization, financial management, defense, business management and public information and education activities.

During his 25-year career with the forest service, Hendee has been continuously engaged in the administration of forest resources. As regional forester in California he was responsible for the management of soil, water, timber, forage, recreation and wildlife resources on 17 national forests; and their protection from fire, insects, and diseases. He also was forest service head of state and federal cooperative forestry programs in California.

Chief McArdle announced further that Charles A. Connoughton, regional forester of the southern region of the forest service with headquarters at Atlanta, Georgia, succeeds Mr. Hendee as regional forester of the California region.

NEW BOOKLET TELLS ABOUT KERN CITIES

Want to know when Wasco was founded? The elevation of Tehachapi? Ridgecrest's population? Type of soil, or the weather in Mojave? Perhaps you're interested in the number of retail and wholesale outlets in Delano?

The answers to all these and scores of other questions conerning Kern County communities may be found in "*Community Information*," a new publication being developed by the Kern County Board of Trade.

Cow Palace

New Freeways Will Speed Traffic to Grand National Show and Rodeo

EXTENSIVE recent freeway construction again this year will add materially to the comfort and convenience of thousands of visitors who annually travel by automobile to the Grand National Livestock Exposition, Horse Show and Rodeo, it was announced by Nye Wilson, Secretary-manager of the huge Cow Palace, where the 1955 show will be held October 28th to November 6th.

Local traffic from San Francisco and the East Bay, as well as traffic from points south, will especially benefit, according to a report which Wilson received from R. P. Duffy, Assistant District Engineer, District IV, Division of Highways, comprising the nine Bay area counties.

In the spring of this year the section of the Bay Shore Highway between Alemany Boulevard and Hester Street, just south of the Third Street intersection, was completed, bringing the Cow Palace within 12½ minutes' drive of San Francisco's Civic Center.

Completion of final sections in downtown San Francisco, making connections to the San Francisco-Oakland Bay Bridge and providing ramp connections to the surface streets at Fourth, Eighth, and Mission Streets, have added also to the ease with which the Cow Palace can be reached.

Traffic Expedited

On the East Bay side of the bridge, portions of the third level of the distribution structure at the approaches have been opened since the last Grand National and sections of the Eastshore Freeway in Berkeley and Oakland have been completed to an eight-lane divided section. Traffic from the south will benefit in great measure from completion of the Bayshore Freeway to a six-lane divided section between San Mateo and San Carlos.

While construction work is still continuing on the Waldo Grade north of the Golden Gate Bridge, converting this section from a four-lane undivided highway to a six-lane divided freeway, no delay in traffic is anticipated. Traffic will be shifted between the existing road and the new lanes to meet construction needs but traffic service will be equal to that previously rendered during the construction period.

Members of the "Riders of the Andes," internationally famous Chilean Army equestrian team, are shown practicing one of their amazing feats of horsemanship

The Cow Palace, with its vast paved and lighted parking areas capable of accommodating 4,000 cars, is particularly well equipped for automobile traffic, Wilson pointed out. He said preparations are being made to handle record crowds in view of the great international attraction which will headline this year's arena show.

Riders of the Andes

Several months ago Wilson flew to Chile, where he made arrangements for the appearance of the "Riders of the Andes," the famous Chilean Army equestrian team from the School for Carabineros, on the outskirts of Santiago, which is the pride of all South America.

On his return he announced that the group, consisting of 30 men and 30 beautifully matched bay horses, has lived up to its reputation in every way, and the members, in his opinion, the world's most fearless and daredevil riders.

They have been in the saddle in rough mountainous country of the far-flung provinces since they were four, or five, years old, only the best being chosen for the "Cuadro Verde," or "Green Squadron."

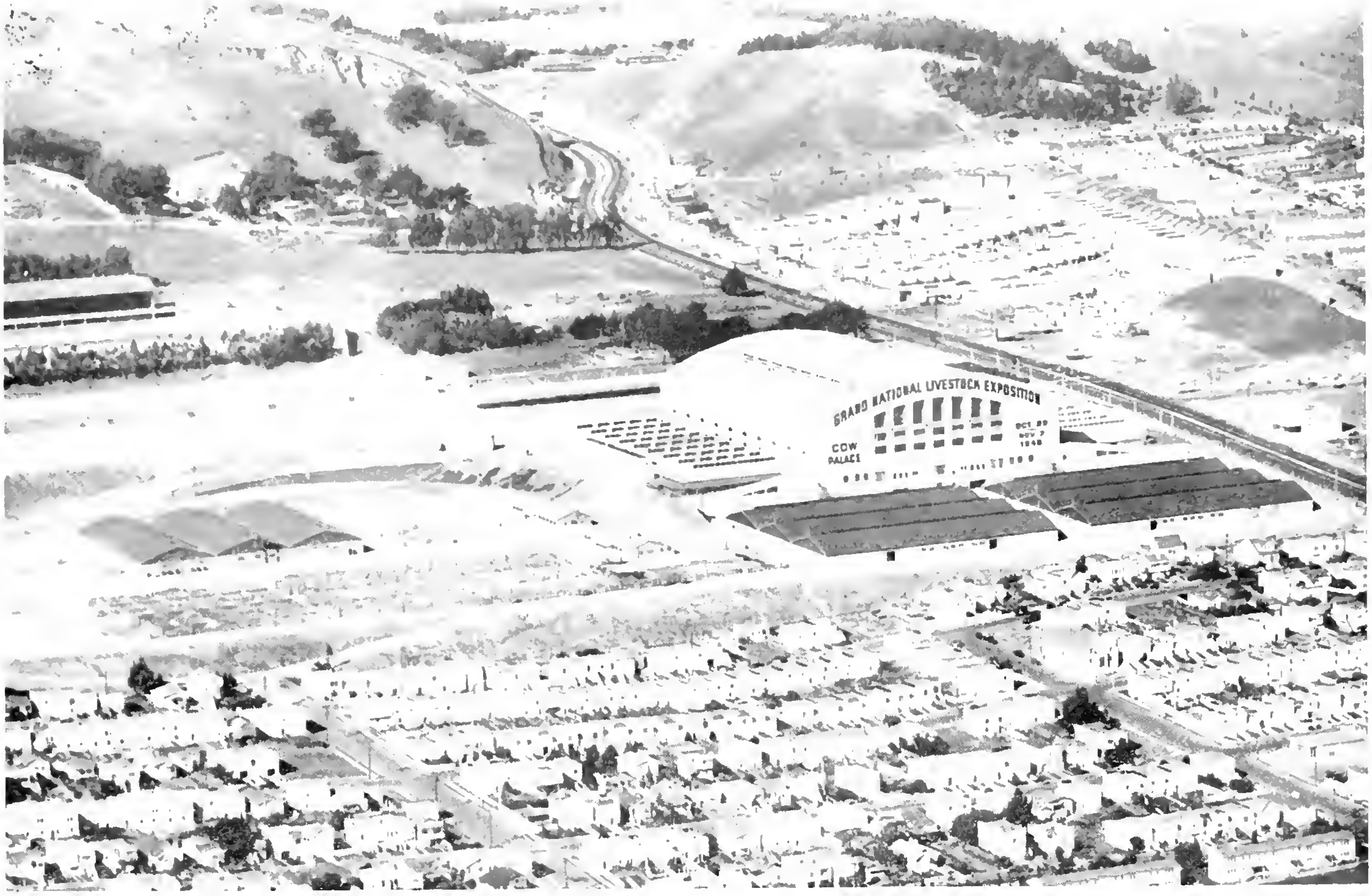
Working with flat Army cavalry saddles without special equipment of any kind, they perform amazing feats of horsemanship—including four abreast pyramids—while traveling at top speed. No comparable attraction has been seen at the Cow Palace since 1952 when the Royal Canadian Mounties were featured and brought an all-time record attendance of more than 170,000 persons.

Back again this year by popular demand will be Capt. William Heyer and his famous dancing horse, "Starless Night."

National Horse Show

Also of special interest to horse lovers will be the full division National Horse Show which will again this year include the National and Pacific Coast Cutting Horse Contest Finals. New classes have been added to the horse show and there will be a special children's matinee on Friday, November 4, for children's equitation and the finals of the A. H. S. A. Stock Saddle Seat competition for juniors.

International Rodeo Association champions in saddle and bareback bronc riding, steer wrestling, calf roping and bull riding will be decided during the Grand National, which, as the last big rodeo of the year, is an important factor also in the world



This is an aerial view of Cow Palace in San Francisco where, as in the past, the Grand National Livestock Exposition, Horse Show and Rodeo will be held October 28 to November 6

championship competition of the Rodeo Cowboys Association.

Three of the Nation's leading stock contractors will pool their strings of broncs, bulls, steers and calves to add to the excitement of the rodeo contests.

In the Livestock Division, where premiums of $88,235 are being offered, national attention will be focused on the National Hereford Show. This show is the only Register of Merit Show for Herefords in California and marks the second time that the national show is to be held at the Cow Palace, the other occasion in 1951.

Ticket prices for the Grand National arena show are $1.25, $2, $2.50, $3, and, for box chairs, $3.50. Parking is 50 cents. Seats may be purchased at the Cow Palace and J. C. Penney Co., in San Francisco; in Oakland at Ina Thrams Box Office, Sherman Clay & Co., and Breuner's, Broadway at 22d; in Berkeley at Breuner's, 2128 Center Street, and in Sacramento at the Civic Theater Box Office. Outside the Bay area, tickets may be reserved at Pacific Greyhound ticket agencies.

The Grand Nationals are sponsored and produced by No. 1-A District Agricultural Association, a State of California agency whose board of directors serves without pay. Directors are: Porter Sesnon, President; Wilson Meyer, First Vice President; Roland Tognazzini, Second Vice President; Louis G. Conlan, Lawrence Draper, Jr., J. W. Mailliard III, George M. Mann and Fred D. Parr.

CLOSE TO HOME—AND DANGER

When you're driving close to home, you're still close to danger. Before turning into that driveway, take a good look about you and make the proper arm signals in a clear and unmistakable way.

ARTICLE APPRECIATED

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

Oakland, California

California Highways and Public Works

GENTLEMEN: I want to express my thanks to the authors of the article "Automation" in your July-August issue. As head of the Right-of-Way Engineering and Survey Branch of the of the Alameda County Flood Control and Water Conservation District, I found the article very interesting and meriting additional study for possible application to our work.

Yours truly,

ROBERT E. ELLIS
171 Via Dolorosa
San Lorenzo, California

Concrete Pipe Jacking Project at Kellogg Hill Is Completed

By ROBERT M. INNIS, Resident Engineer

WORK WAS STARTED this spring on the last section of the San Bernardino Freeway in District VII. This 5.21-mile contract, awarded to Winston Bros. Company, extends from West Covina over Kellogg Hill and connects to the completed freeway through the City of Pomona. The alignment of the new freeway is essentially the same as the existing route, Garvey Avenue, with the grade some three to four feet higher.

Since the terrain is mountainous and has many cross canyons and high fills on the existing route, the problem of drainage was quite interesting. Should we replace the existing drainage with new installations or extend the existing culverts? Since the culverts had been in place since 1932, and the grade differentials between the ends of the existing culverts and the proposed toe of slope in the canyons prevented any pipe extensions without an objectionable sharp grade break, it was decided to install new culvert pipe throughout. To replace this cross drainage by open cut method was obviously prohibitive—first, because the height of the existing fills was so great, and secondly, because public traffic had to be maintained on the existing Garvey Avenue. Therefore, the contract provided for jacking approximately 2,000 feet of reinforced concrete pipe ranging in diameter from 24 inches to 54 inches.

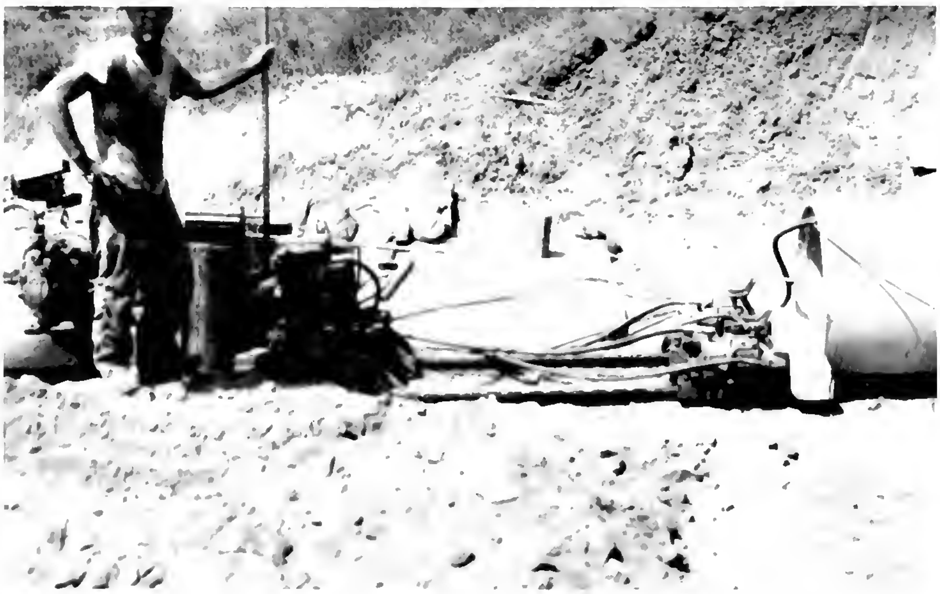
Contractor's Option

The contractor had the option of using 30-inch pipe in lieu of the 24-inch and 27-inch sizes to provide more working room. Consequently, 30-inch pipe was used at all locations where smaller pipe was specified. All pipe to be jacked was specified to have a 2,000-D load factor. The jacking pit was usually set up at the downstream end of the line and the pipe was jacked up grade. This was done to prevent any water from staying in the pipe heading.

Sled and trigger winch used in removing excavated material

The lengths of the lines to be jacked varied from 160 feet to approximately 330 feet and these were all jacked from one jacking pit at each location. The setting up or installation of the jacks, rails, and backstops called for very close accuracy for line and grade as the specified tolerance allowed only 3 inches per 100 feet variance in line and grade. The complete jacking operation at each location was performed by two men: one inside the pipe with

Excavated material about to be removed



a short hand pneumatic clay spade and shovel and the other man operating the air tugger winch which pulled the dirt sled in and out. The man working in the pipe would excavate approximately two feet ahead of the pipe and then it would be jacked up snug against the dirt heading. Line and grade control was the sole responsibility of the man working in the pipe and was done by neat grading for the perimeter of the pipe up to approximately 18 inches above the flow line. However, at the time of the actual jacking the lead pipe section would deflect due to soil variations. In hard soil conditions the lead pipe would rise and in wet excavation the pipe would deflect downward.

Field Checks

At frequent intervals, field checks for line and grade were made with instruments and the variation from the theoretical line and grade was determined. The crew would then try to work back to the theoretical line. Although the end pipe would hole through within 6 to 10 inches of the theoretical location, the pipelines as laid, especially those over 150 feet in length, would be a series of small deflections. The average day's work would run between 8 and 10 feet of pipe jacked in a 10-hour shift. Each section of pipe was coated with Bentonite rotary mud for lubrication and was butted against the adjacent section of pipe with a one-half inch mortar pad for bearing. The new pipe sections were usually placed at the end of each shift so the mortar could set up during the night. Two 75-ton hydraulic jacks were used on the 30-inch diameter pipes and two 200-ton jacks were used on the 54-inch line.

The key to successfully jacking the long lengths of R. C. P. on this contract was the soil condition. The old fills were well compacted and no large boulders or rock were encountered. The material was such that it would tunnel and hold its shape—the result being there was no overhead displacement or load on the pipeline being jacked. Any vertical load would have made jacking impossible. The pipe seemed to jack smoothly up to around 200 feet of length but from then on considerable stress was evident, with small chips spalling out at the joints. However, and luckily, there developed no complete pipe failure or serious cracking.

Jacking operation at Kellagg Hill

The pipe jacking work on this contract has been completed, with a total of 1,815 feet of pipe being jacked. The work of jacking the reinforced concrete pipe was performed by the J. S. Barrett Co., subcontractor for Winston Bros.

View of equipment and two-man crew used in jacking operations

NEW UNIT OF EASTSHORE FREEWAY IS OPENED TO TRAFFIC

LEFT—New unit of Eastshore Freeway extending from 11th and Cypress Street to Market Street in Oakland. RIGHT—Construction has started on a major project along Cypress Street that includes a double-deck viaduct from the Distribution Structure of the Bay Bridge southerly to 16th Street.

A new unit of the Eastshore Freeway in Oakland which extends from 11th and Cypress Streets to Market Street was opened to traffic Friday, September 2, 1955, at 11 a.m.

This 0.7-mile project consists of a short section of an elevated freeway structure together with approach ramps which will later serve as on and off ramps for local traffic when the adjoining units of the facility will be completed. In addition to eliminating conflicts at a number of cross streets, traffic will no longer be subjected to the delay occasioned by the jog in the route from Seventh and Eighth Streets to Fifth and Sixth Streets.

As this completed section initially constitutes only a short link on this freeway route, motorists should exercise caution and be prepared to reduce speed as dictated by traffic conditions. This is especially important because traffic on adjoining street sections is subject to control by traffic signals and at certain periods, particularly during peak hours, congestions may extend back onto the freeway.

Cost $1,762,000

Work on the contract for this unit was performed by Fredrickson & Watson Construction Company and M & K Corporation, at a cost of $1,762,000.

Work has also just been started on a major project along Cypress Street that includes a double-deck viaduct from the distribution structure southerly to 16th Street. Plans are being completed for subsequent projects to fill the gap between the completed freeway unit and 16th Street to the north, and in a southerly direction to Oak Street.

Freeway Routing

The California Highway Commission has adopted a freeway routing for 11.8 miles of State Sign Route 198 (Hanford-Visalia Highway) between Ninth Ave., one mile east of Hanford, Kings County, and U. S. Highway 99.

Since the freeway route follows the existing highway a public hearing by the commisison was not considered necessary.

State Highway Engineer G. T. McCoy told the Commission that although construction might be some time in the future adoption of a freeway routing at this time was desirable to make known the State's plans for ultimate development and to protect needed rights of way.

Plans of the Division of Highways call for the eventual construction of a four-lane expressway over this section at a cost of approximately $1,770,000.

Slurry Seal Coat

Division of Highways Conducting Experiments

By MERLE L. NELSON, Highway Engineering Associate

The problem of maintaining our highway surfaces in a smooth-riding and presentable condition has long been a thorn in the side of the Maintenance Department of the Division of Highways. One of the most costly and time-consuming maintenance operations is crack sealing. A good many of our bituminous pavements which exhibit severe cracking and spalling could be restored to give several additional years of satisfactory service by a suitable method of filling and sealing the cracks and spalls. The conventional type of seal coat has not provided a satisfactory treatment in all respects.

Headquarters Maintenance Department recently requested that the Materials and Research Department investigate and report on a new type of surface treatment called Slurry or Squeegee Seal Coat which had been developed and used quite extensively by the City and County of Los Angeles for sealing old bituminous pavements.

The slurry seal consists of mixing a fine sand or crusher dust or a combination of both with mixing type emulsion and water to form a very wet slurry.

A typical batch mixed in an ordinary transit mix truck would consist of the following composition.

For each ton of aggregates (dry weight) add

25 gallons of water
47 gallons of emulsion

The water can be varied to obtain the desired consistency to suit certain conditions.

The emulsion being used at present is mixing type emulsion (65-85 pen. base); also (150-200 pen.) has been used to some extent as the base asphalt.

Satisfactory Gradation

The aggregates should conform reasonably close to the following gradation which has been considered to be satisfactory.

Sieve sizes	*Percent passing*
No. 20	100
No. 30	91
No. 50	54
No. 100	20
No. 200	3

The emulsion and water are added to the mixing drum and the aggregates are then added slowly to prevent balling. Approximately five minutes is required to add the aggregates. The surface to be treated is sprinkled with water, normally about 0.10 gallon per square yard.

The slurry is then poured from the transit-mix truck onto the pavement inside a specially constructed spreader box which consists of a rectangular

Watering the pavement

Slurry train in action

frame the width of one lane. The "box" is equipped with a squeegee strike-off rubber which forces the slurry into all cracks and depressions in the pavement as the spreader is towed along the pavement behind the truck. The result is a very uniform and rejuvenated appearing pavement.

Under normal weather conditions traffic can use the treated surface in from 1½ to 3 hours after application and in certain instances in less time.

Conclusions

The following conclusions were arrived at after representatives of this department made an inspection of the slurry projects placed by Los Angeles County forces and a few experimental projects placed by our maintenance forces in District VII:

1. It is our opinion that the slurry seal, while not a cure-all, has a very definite place in maintenance work.
2. The treatment appears to do an excellent job of crack sealing and provides what appears to be a very satisfactory nonskid surface, especially when sand is used as the aggregate.
3. The mixture is cheap and can be applied at an amazingly fast rate.
4. Depending upon weather conditions, the slurry seal will set up sufficiently hard in some two to three hours so that it will not be marred by traffic.
5. The treatment is unsurpassed for use in city streets and residential areas where other types of surface treatments have always presented problems.
6. The mixture should not be considered as a substantial wearing surface and no attempt should be made to apply it in thicknesses greater than one-fourth inch and preferably one-eighth inch. This will permit faster set up and is important particularly on two-lane roads where traffic controls are to be enforced.
7. If a somewhat thicker layer is desired it is recommended that it be placed in two thin layers with proper time intervals for complete drying and setting up.
8. In addition to filling all cracks and holes in old surfaces the treatment improves the appearance of old pavements 100 percent.
9. The mixture sticks tenaciously to the old pavement, providing a tight seal.
10. District VII maintenance personnel and maintenance men of the County of Los Angeles are completely enthusiastic about the treatment.
11. We have recommended that maintenance forces place some experimental sections of this treatment in the vicinity of Sacramento for observation.

Spreading slurry

Completed slurry in right lane

McCoy Reports on Button Canyon Project

It would cost approximately $600,000 to construct an adequate two-lane road on a six-mile stretch of Sign Route 36 in Tehama County through the Button Canyon section, according to State Highway Engineer G. T. McCoy.

The Highway Commission asked McCoy for a report on the section between Tedoc Road and Dry Creek after a delegation from Tehama County and the City of Red Bluff had appeared at the commission's meeting in August requesting improvement of the existing road. Contributions of $25,000 each toward the project were offered by Tehama County and the Smith Lumber Company.

The road at present follows a narrow tortuous canyon, and an interim-type improvement is not feasible, McCoy said; any reconstruction should be on the basis of providing an adequate facility on permanent alignment.

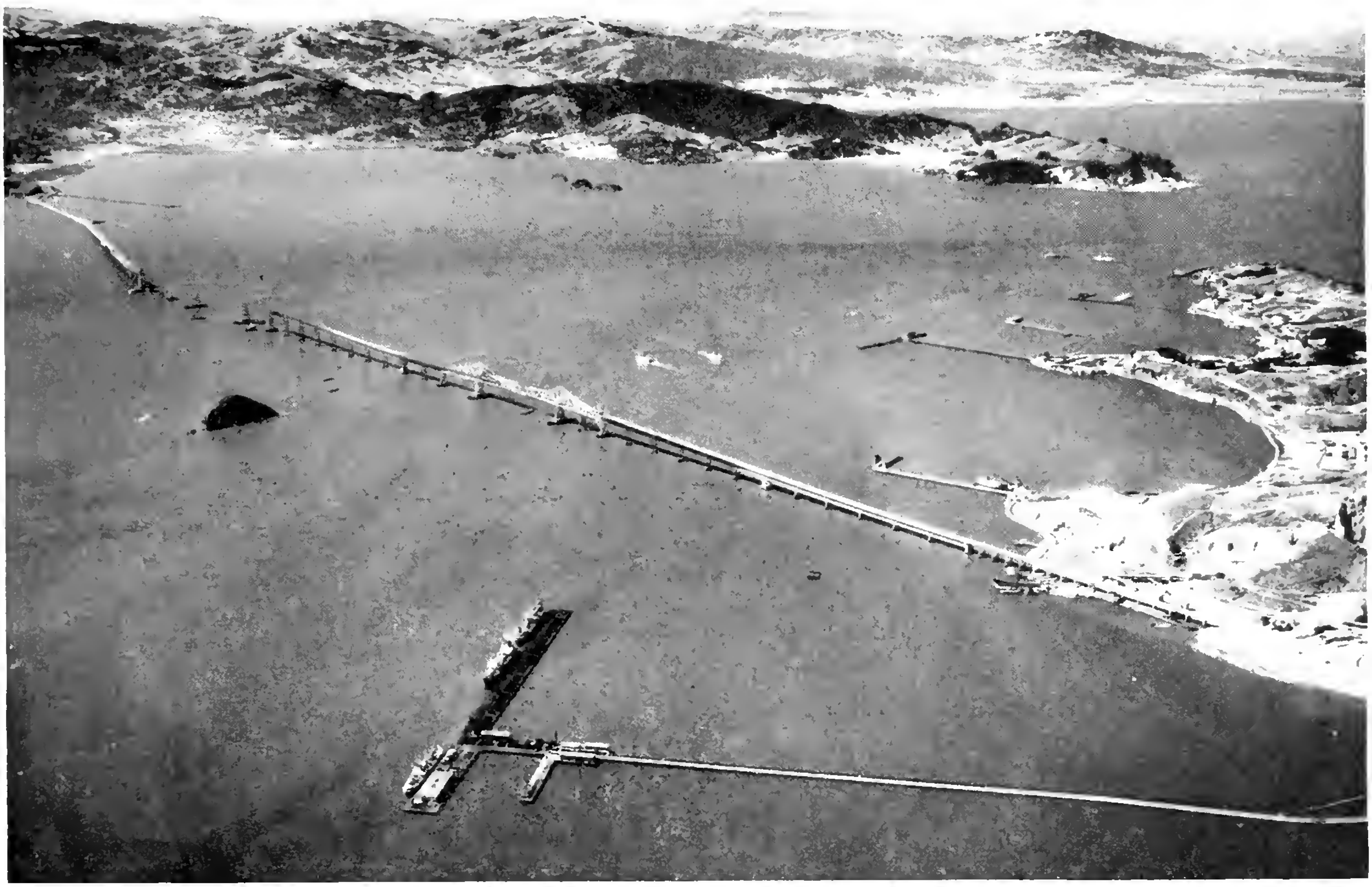
Rapid Progress

Richmond-San Rafael Bridge Is More Than 80 Percent Completed

On Wednesday, September 14, 1955, workmen for the Murphy-Kiewit superstructure contract of the Richmond-San Rafael Bridge, now nearing completion in the northern part of San Francisco Bay, slipped the 12-inch pins into position connecting the lower chords of the east cantilever span.

At the same time the last of the 36 289-foot truss spans are being completed. Of the 18,500 feet of steel spanning the Bay, only the 2,140-foot cantilever structure over the west navigation channel remains for completion. Already workmen have erected the two main steel towers and are now progressing out on each side of bridge is being constructed, said the project now is more than 80 percent completed.

The newly completed span is over the secondary navigation channel paralleling the Richmond pierhead line. The two cantilevers are of identical design, each having a main span of 1,070 feet with 535-foot anchor arms.



This aerial photo shows the gap in the east cantilever span of the Richmond-San Rafael Bridge which was closed on September 14. The progress on the project, now more than 80 percent completed, is graphically shown.

This operation, together with the subsequent placing and riveting of several other truss members, closed the gap of the first of the two cantilever spans over the main navigation channels.

one of the towers with the intricate and delicate balancing of the steel truss members.

Norman C. Raab, Chief, Division of San Francisco Bay Toll Crossings, under whose personal supervision the

The vertical clearance for shipping over this channel is 135 feet while a clearance of 185 feet will be provided over the main channel.

. . . Continued on page 41

Foothill Freeway

Narrow Devil's Gate Roadway Is Eliminated

By C. J. VERNER, Resident Engineer

On New Year's Day, 1956, the spectators who attend the annual Tournament of Roses and the Rose Bowl football game in Pasadena will find motoring to and from these events less time consuming. A 1¾-mile section of the Foothill Freeway between Hampton Road in La Cañada and Montana Street in Pasadena will have been completed in the autumn of 1955.

The section of State Sign Route 118 on which the improvement to full freeway standards has been provided by action of the State Highway Commission voting funds on July 24, 1953, for construction, eliminates the old narrow roadway across the Devil's Gate Dam as well as a sharp curve and grade intersection with State Sign Route 11 at the westerly end of the dam.

The portion of Route 118 between San Fernando and Pasadena traverses the foothill area of the towering San Gabriel Mountains immediately to the north, which provide areas for summer outings and winter sports to the public.

This new Devil's Gate Dam bridge eliminates old, narrow roadway as well as a sharp curve and grade intersection with Sign Route 11 at westerly end of dam

Excellent Cooperation

Among the 17 bids submitted, joint venturers George W. Peterson, Jack W. Baker and Dragline Rentals Company submitted the low bid of $1,831,070 which was approved as a contract by the Attorney General of the State on March 17, 1954.

The excellent cooperation received during the construction from the various agencies involved and the diligent prosecution of the work under the supervision of George W. Peterson as project manager enabled the contractor to complete the project approximately three months prior to the expiration of the allowable time specified for this contract.

The new alignment and the existing roadway conflicted at numerous locations. Five stages of varying amounts of detouring were required for public traffic during construction. As each successive stage came into play, traffic was allowed more of the new roadway for its use. Fortunately each successive stage partially alleviated the congestion existing prior to construction, so that the full improvement of traffic flow came gradually to the motoring public as the job progressed. The close proximity of existing roadway and new construction in several instances necessitated opening portions of structures to traffic before the remaining portions of these structures could be completed.

Seven Structures on Freeway

Seven structures are required in the length of the project to provide full freeway standards. These structures range in size from an equestrian trail undercrossing to the unique bridge across the Arroyo Seco and spillway of Devil's Gate Dam.

Driving easterly from Hampton Road on the new four-lane freeway which is composed of two 28-foot roadways surfaced with four inches of plant mix on eight inches of untreated select material, the motorist will pass under or cross over structures in the following order.

The Meadow Grove Street Overcrossing is a reinforced concrete box girder bridge about 157 feet long.

The Berkshire Place Undercrossing is a reinforced concrete slab bridge about 45 feet long.

The Route 165/9 Separation is a reinforced concrete box girder bridge about 344 feet long which connects the west bound traffic lanes of the freeway with State Sign Route 11, spans over Flint Canyon Wash as well as the freeway. The roadway of the bridge across the wash which parallels the freeway at this location is supported on single multifaced column bents which rise 50 feet above the wash presenting a graceful appearance.

Series of Bridges

The Flint Canyon Wash Bridge is a reinforced concrete slab and box girder about 348 feet long. The existing timber structure adjacent to the new bridge will remain in service to be used for access to Oak Grove Park.

The distance to the next bridge is 400 feet. The roadway excavation prism in this distance yielded over 100,000 cubic yards for use as roadway embankment or select material as base for the plant mix surfacing.

We are now at the brink of the Arroyo Seco across which the Los Angeles Flood Control District constructed Devil's Gate Dam in 1920 to restrain the destructive flood waters that were periodically carried by the Arroyo Seco.

The Arroyo Seco Bridge is a reinforced concrete box girder about 418 feet long, adjacent to the downstream face of Devil's Gate Dam. Two spans each 136 feet long are required to cross the arroyo, and one span 119 feet long is required to cross the dam spillway. The pier which acts as the common support for the two 136-foot spans is rigidly connected to the superstructure, while all other supports are simple connections. To obtain the required rigidity the eight-foot depth box girder gracefully increases to 14 feet at the pier beginning 65 feet each side of the pier. The pier which is cellular with outside faces rusticated to provide appearance of masonry blocks reaches upward 85 feet above the arroyo bottom to support the superstructure, and extends downward 20 feet below the arroyo bottom for adequate support on rock.

The Arroyo Seco Equestrian Tunnel is a reinforced concrete box eight feet wide, 10 feet 6 inches high and about 118 feet long. The tunnel provides grade separation for the equestrian trail existing in this location prior to construction.

The Arroyo Boulevard Overcrossing is a reinforced concrete box girder bridge about 107 feet long.

The contract work is being administered by the Bridge Department. L. E. Steele represents District VII on the project.

Aerial view of Foothill Boulevard looking westerly across Devil's Gate Dam, showing portion of old highway alignment on left

RAPID PROGRESS

Continued from page 39 . . .

Paving of the roadway has kept pace with the steel erection, and of the four miles of overwater crossing $1\frac{1}{2}$ miles of the upper deck have been completed on the west end of the bridge and one mile on the east or Richmond end.

Of the 15 contracts required to complete the project for upper deck traffic, five have been completed; nine are under construction; leaving one, for the signing and striping of the roadways, to be advertised in time for the opening of the bridge to traffic by October of 1956.

One of the five contracts for the completion of the lower deck for an ultimate six lanes of traffic is now being advertised with the remainder to follow as needed. This second phase of construction should be completed by October of 1957.

Revenue bonds in the amount of $62,000,000 were sold to finance the first phase construction while a state loan of $6,000,000 will be used to complete the second phase giving a total cost of $68,000,000 for the $5\frac{1}{2}$-mile project.

OAKLAND TO TRACY FREEWAY

Completion of the freeway on U. S. 50 from Oakland through Castro Valley to Tracy in San Joaquin County is in sight. Director of Public Works Frank B. Durkee awarded a contract for $4,275,510.70 to Peter Kiewit Sons Co. for grading and paving 5.4 miles between 2.3 miles west of Dublin and 0.3 mile west of Center Street in Oakland.

Retirements *from* Service

E. E. Wallace

E. E. Wallace, district engineer of District XI of the Division of Highways, retired on September 1, 1955, bringing to an end a career of 42 years of important contributions to the development of California's Highway System.

He has been in charge of District XI since the district was established in 1933, with headquarters at San Diego. It comprises San Diego and Imperial Counties and the eastern half of Riverside County, with a total of 1,100 miles of state highways ranging from major metropolitan freeways to long stretches of desert road.

Wallace came to work for the State in 1913 in the District V Office in San Luis Obispo. By 1919 he had become assistant district engineer there. One of his assignments was the location of SSR 1, the Carmel-San Simeon Highway.

To Fresno in 1926

In 1926 he was appointed district engineer of District VI, with headquarters in Fresno, and remained there until the formation of District XI in San Diego seven years later. His accomplishments during this period included construction of the Grapevine Grade Section of US 99 south of Bakersfield and reconnaissance for the mountain highway which now carries traffic into Kings Canyon.

Starting as the first district engineer of District XI, his administration in San Diego has spanned the period of that area's tremendous growth in population and traffic, particularly during and since World War II.

During the wartime period Wallace was responsible for planning and construction of important access roads developed by the State for the Federal Government to serve aircraft plants, shipyards and military establishments. Shortly after the war the Cabrillo Freeway was completed as one of California's earliest full freeways. Subsequent major projects planned and completed under Wallace's direction include the Oceanside-Carlsbad Freeway and the Montgomery Freeway between National City and the Mexican border, both on US 101.

Freeways Accelerated

Planning for other freeway sections of US 101 and for US 80 in the San Diego metropolitan area has been accelerated in the last few years under the expanded state highway program.

In the meantime, over the last 22 years, Wallace directed the continuous improvement of state highways in the desert areas of District XI, with emphasis on widening of both the traveled way and the numerous bridges, as well as resurfacing and, in recent years, reconstruction.

Wallace was born in Harlan, Iowa, and received his early education there and in Alabama and Tennessee. He graduated from the University of Alabama where he studied civil engineering.

His first engineering job was as a civilian employee with the U. S. Corps of Engineers in 1908 on lock and dam construction in Alabama. The following year he went to work for the Southern Pacific Railroad in Los Angeles and Bakersfield.

Frank C. Balfour introduces Mrs. Janet W. Adams and Rev. Donald Wallace, daughter and son of Mr. and Mrs. Wallace, seated on his left

From 1911 to 1913 he was employed in the engineering department of the Associated Oil Company in Bakersfield.

Wallace lives at 3245 Elliott Street in San Diego. He is married and has a son, Donald, of Syracuse, New York, and a daughter, Janet W. Adams, of Pasco, Washington.

Wallace Tendered Farewell Dinner By Many Friends

San Diego went all out to show its appreciation of E. E. Wallace upon the occasion of his retirement. Under the auspices of the San Diego Chamber of Commerce a dinner in honor of Mr. and Mrs. Wallace was tendered in the El Cortez Hotel on Friday night, August 26th. Friends and associates of Wallace numbering 562 were in attendance.

In addition to engineers and other employees of the Division of Highways from many sections of the State, there were present members of the California Highway Commission, state legislators, mayors of incorporated cities and county supervisors in San Diego, Imperial, Riverside, and San Bernardino Counties, comprising District XI of the Division of Highways.

Introductory remarks on behalf of the San Diego Chamber of Commerce were made by Robert M. Golden, president, who introduced Frank C. Balfour, Chief Right of Way Agent of the Division of Highways, as master of ceremonies. Balfour presented Dr. William B. Livingstone, Pastor of the First Presbyterian Church, who delivered an invocation.

Among those at the head table with Mr. and Mrs. Wallace were Highway Commissioner James A. Guthrie, San Bernardino; Commissioner and Mrs. Fred W. Speers, Escondido; Mrs.

Janet Adams, daughter, and Rev. Donald Wallace, son of Mr. and Mrs. Wallace; Mr. and Mrs. Golden, Mrs. Frank C. Balfour, Vice Mayor Clair W. Burgener, San Diego; Chairman Frank A. Gibson of the San Diego Board of Supervisors and Mrs. Gibson; Assistant State Highway Engineer Charles F. Waite, Sacramento, representing State Highway Engineer George T. McCoy; T. Fred Bradshaw, Assistant Director of Public Works, Sacramento, representing Director of Public Works Frank B. Durkee; and R. B. Luckenbach, Assistant District Engineer of District XI.

Mrs. Adams and Reverend Wallace surprised their father by coming from Washington and New York to attend the farewell party.

Vice Mayor Burgener spoke for all the incorporated cities and Supervisor Gibson spoke on behalf of the counties represented. All the speakers highly praised Mr. Wallace for his unselfish service with the Division of Highways for 42 years.

Numerous gifts from friends and associates of Mr. Wallace were presented to the guest of honor by Luckenbach.

Mr. Wallace shows Mrs. Wallace handsome wrist watch presented to him by his associates

Assistant State Highway Engineer C. E. Waite

CALIFORNIA IS APPORTIONED $47 MILLION FOR HIGHWAYS

California has received an apportionment of $47 million in Federal Aid funds for highways during the fiscal year beginning in 1956.

Of this amount, $14½ million is for the primary highway system, $7½ million for secondary or feeder roads, $15 million for urban highways, and almost $10 million for that portion of the Interstate Highway System which is in the State.

The apportionment is the second and last under the provisions of the Federal Aid Highway Act of 1954. The act authorized $1,750,000,000 in grants to the states and other federal highway projects for the two fiscal years beginning July 1, 1955 and 1956.

HOBART MILLS JOB

The California Highway Commission has adopted a route for a proposed relocation of approximately 4½ miles of State Sign Route 89 (Truckee-Quincy Highway) in the vicinity of Hobart Mills, Nevada County. The adopted route extends from 0.7 mile south of Prosser Creek to 1.6 miles north of Hobart Mills. For the most part it runs to the northeast of the present highway on a generally parallel course.

DRIVER'S LICENSE

Every motorist should have his driver's license with him at all times when he is driving.

The California State Automobile Association reminds you that failure to have it in your possession while driving may result in a fine.

Edmonston, Waddell And Jones Retiring From State Service

An employee of the State of California since September, 1924, A. D. Edmonston, State Engineer, Chief of the Division of Water Resources, notified Director of Public Works Frank B. Durkee of his intention to retire on November 1, 1955.

After about 14 years of employment as an engineer in connection with design and construction of hydraulic structures on various irrigation, hydroelectric and municipal water projects in California, Edmonston entered service as an engineer in charge of investigations and preparation of reports on the water resources of California. Formulation of the State Water Plan, as reported to the Legislature of 1931, including plans for the Central Valley Project, were under his direct charge.

A. D. EDMONSTON

THOMAS B. WADDELL

GERALD H. JONES

Succeeds Edward Hyatt

In 1945 he became Assistant State Engineer and in February, 1950, he was appointed State Engineer of California, succeeding the late Edward Hyatt and in this capacity, Edmonston is in direct charge of all state functions dealing with water rights, appropriation of water, adjudication of water rights, watermaster service, safety of dams, supervision of use of water of Sacramento and San Joaquin Rivers, maintenance and operation of Sacramento River Flood Control Project, investigations of surface and underground waters and water quality and pollution. He is also in charge of the division's cooperative programs with the Federal Government involving stream gaging, snow surveys, topographic mapping, irrigation investigations, ground, surface and water quality investigations, beach erosion and the Sacramento River trial distribution program.

As State Engineer, Edmonston is Engineer and Secretary of the State Water Resources Board under which he is conducting the investigations for the California Water Plan, the initial unit of which—the Feather River Project—was authorized for state construction in 1951.

Holds Important Jobs

The State Engineer is Executive Officer of the Water Project Authority of California, which was created by the Central Valley Project Act of 1933. Acting for the authority, Edmonston has prepared the reports on Feasibility of State Acquisition of the Central Valley Project, Central Valley Project Management, and is conducting the trial distribution studies on the Sacramento River under contract between the authority and the U. S. Bureau of Reclamation. He is in charge of the San Francisco Bay Salinity Control Barrier Investigation, the report on which will be made to the water Project Authority.

The State Engineer also serves as a member of the Districts Securities Commission, State Water Pollution Control Board, the State Soil Conservation Commission, the California Colorado River Boundary Commission, the California-Nevada Water Compact Commission and the California Klamath River Commission. He is a Director and Past President of the Association of Western State Engineers.

Edmonston is a member, American Society of Civil Engineers, and also belongs to the American Geophysical Union, American Water Works Association, Commonwealth Club, and Tau Beta Pi, National Engineering Honor Society.

The post of State Engineer is subject to civil service law and the Personnel Board will be requested to hold an examination to fill the position.

Woddell Also to Retire

After 38½ years of state service Thomas B. Waddell, Assistant State Engineer, notified Director of Public Works Frank B. Durkee that he will retire on November 2d. Waddell is retiring at the age of 65 years. His retirement will follow by one day

. . . Continued on page 47

Raymond P. Duffy

Raymond P. Duffy, assistant district engineer in charge of construction for District IV retired on October 1st, culminating a 41-year career with the State, 34 years of it with the Division of Highways in San Francisco. Duffy came to work for the division in 1921 as a construction inspector.


RAYMOND P. DUFFY

Prior to that time he worked for six years with the State Harbor Commission in San Francisco which included an assignment as transit man on the construction of the tunnel underneath Fort Mason between Van Ness Avenue and the Army Transport Docks.

After five years on construction and maintenance work with the Division of Highways, Duffy was promoted to maintenance engineer for District IV in 1926. In 1939 he became district construction engineer and in 1947, when the division was reorganized and expanded following passage of the Collier-Burns Highway Act, he was promoted to assistant district engineer—construction, the post he held at the time of his retirement.

As assistant district engineer Duffy has had direct supervision over all construction work on state freeways and other highways in San Francisco, San Mateo, Santa Clara, Santa Cruz, Alameda, Contra Costa, Solano, Napa, Sonoma and Marin Counties.

Born in San Pablo, Duffy attended schools in Marin County and received his engineering education at the Vander Naillen School of Engineering in Oakland.

His first engineering job was with the U. S. Department of the Interior working on various projects in Nevada and Arizona during 1911 and 1912.

Duffy and his wife live at 239 C Street in San Rafael.

Walter J. Long

Walter J. Long, senior structural engineer in the State Division of Architecture, began his retirement career on September 1st. Long has worked for the division under four state architects and six chief structural engineers during a period of over 44 years since he first started working with the division in 1911. He has had continuous service with the architect division except for a seven-year interval in the mid-1920's when he worked as principal engineer for the late R. A. Harold, Sacramento architect, and for the architectural firm of Dean and Dean of Sacramento.


WALTER J. LONG

The late Maury I. Diggs, State Architect, first put Long to work as an architectural draftsman. Long progressed successively in other classifications as structural draftsman, superintendent of construction, estimator, structural engineering designer, and senior structural engineer. He has held the latter position since 1933.

Long is the son of a general contractor and a native of Denver, Colorado, where he attended the public schools. Following high school he worked five years for different architects in Denver before coming to California. He has an architect's license and a structural engineer's certificate in California and belongs to the Structural Engineers' Association of Central California.

He is married to Luella A. Martin, daughter of the late Dr. and Mrs. James J. Martin, a well known Sacramento family. They have two children, a son and a daughter. Long plans to spend his retirement in travel and in pursuing various activities for which he's had little time during his professional career.

James H. Goodwin

After 36 years of service with the Division of Highways, James H. Goodwin, Highway Mechanic Foreman, Shop 9, Bishop, retired in August.


JAMES H. GOODWIN

Jim was born in Independence, Missouri, November 17, 1895. His family moved to California in 1903 and settled in Oakland in 1906, where he was educated in the public schools. He served his apprenticeship as machinist, mechanic and blacksmith in Stockton, and was then employed by the Holt Caterpillar Manufacturing Co.

In 1917, he enlisted in the Army and served 18 months overseas, as automatic rifleman, Co. B, 128 Infantry, 32d Red Arrow Division. He was wounded in action at Chateau Thierry.

After his discharge from the Army and return to California in 1919, he secured a position at Headquarters Shop, Sacramento, on July 23, 1919. He was later assigned to District III where he remained until 1923 when he transferred to District VI. In July, 1925, he was appointed highway mechanic foreman of Shop 9, and has held that position since that time.

Jim has been a member of the American Legion for 35 years and is a member of 40 and 8 and D. A. V. He is a Past Commander of Post 118 and the 27th District, Past Adjutant Post 118 and 27th District of the American Legion.

He is a member of F. & A. M., Royal Arch, 32d Degree Scottish Rite Masons, Shrine, and Order of Eastern Star.

He is a charter member of Fresno Chapter No. 11, C. S. E. A., later transferring to High Sierra Chapter No. 12.

Jim's principal hobbies are activities in veteran, civic, and fraternal affairs and he expects to be well occupied with these and other activities now that he is retired.

CEREMONY MARKS COMPLETION OF NEW FREEWAY

One of the major accomplishments of Ed Wallace as district engineer in San Diego was the construction of the Montgomery Freeway.

Ceremonies marking completion of the freeway, a $7,000,000, 11.1-mile span between National City and the Mexican border, were held June 17th with United States and Mexican officials participating. The program was arranged by the San Diego Chamber of Commerce. Supervisor David Bird was chairman.

Horsemen from the United States and charos from Baja California met in front of a platform alongside the freeway about a half mile north of the border in an impressive friendship gesture. Scrolls signed by Governor Knight of California and Governor Braulio Maldonado of Baja California were read and exchanged.

Moreno Henriquez, Lieutenant Governor of the new Mexican state, headed a large delegation from south of the border. He referred to the freeway as "another strong tie which binds us together."

Fred Speers, Escondido member of the California Highway Commission, represented Governor Knight, reading a message from the Governor and speaking briefly.

An impressive parade arranged by civic workers of San Ysidro preceded the platform ceremony.

National anthems of the United States and Mexico were played by the Naval Training Center Band of San Diego. Rev. Seraphin Muller of San Luis Rey Mission pronounced the invocation.

The new freeway links Highway 101 with principal highways of Baja California.

Shown on the platform, left to right, are Fred Speers, Escondido member of the State Highway Commission who represented Gov. Knight; Moreno Henriquez, lieutenant governor of Baja California; Supervisor Dave Bird, toastmaster; Mrs. C. G. Buehrer, San Ysidro parade marshal; Reyno V. Swedd, "Miss Mexico" for the ceremony, and Sammy Payne, who represented Uncle Sam.

By Governor Knight *

A warm greeting on the success of the completion of the John J. Montgomery Freeway which unites the peoples of two great states, Baja California, and Alta California.

I congratulate Mr. Braulio Maldonado and other authorities of Lower California for the great steps they have taken to face the problems imposed upon the state for reasons of its rapid growth. Their acknowledgment of the value of this new freeway that will bring the two areas closer indicates to us that it is a progressive administration.

The Montgomery Freeway is a route of significance for various reasons: From the standpoint of economy it will promote the continuous commercial and industrial development between Mexico and the United States.

For the tourists of both states there will be a facilitation of transit between the tourist areas.

Commercially there will be easy distribution of materials accessible to both countries.

I trust that this route that so closely follows the path traced by Father Junipero Serra, will, in time, be the strongest link that will extend from the capital of Mexico to the capital of California, Sacramento.

GOODWIN J. KNIGHT, Governor
State of California

** Free translation of Governor Knight's message which was in Spanish.*

By Governor Maldonado

Commemorating the dedication of San Diego County's and California's great Montgomery Freeway, which has become a link in the highway system of Baja California, I, Governor Braulio Maldonado of Baja California, Mexico, do extend my heartfelt felicitations to the Honorable Goodwin Jess Knight, Governor of California, U. S. A.;

And express to him the sincere appreciation of the people of Baja California, Mexico, for the great highway program his State has undertaken.

Improvement of the economic well-being of the people on both sides of the border will result from highway construction programs in the two Californias. Montgomery Freeway will become an important link in our circle highway from Tijuana to Ensenada and inland return by way of Tecate, the latter part of which will be completed this year.

May the dedication of the new Montgomery Freeway always remain as a symbol of the sincere friendship of the peoples of the United States and Mexico. May this token of gratitude always remain as a constant reminder of accomplishments of neighbors dedicated to democratic principles.

BRAULIO MALDONADO, Governor
State of Baja California, Mexico

EDMONSTON RETIRING

Continued from page 45 . . .

those of State Engineer A. D. Edmonston and Assistant State Engineer Gerald H. Jones.

Waddell graduated as a civil engineer from the University of California in 1912. For one year he was in private employment and in August, 1913, accepted appointment as assistant flood control engineer of the old State Department of Engineering in charge of plans for a flood control system for the Sacramento and San Joaquin Valleys. In January, 1918, he was named principal assistant engineer for the State Reclamation Board, a position he held until March, 1923, when he entered private employment for a period of two years. He returned to state service in August, 1925, as hydraulic engineer for the old Division of Engineering and Irrigation.

From August, 1929, to August, 1931, he was hydraulic engineer for the Division of Water Resources in charge of Sacramento Valley studies for the State Water Plans. From July, 1931, to September, 1946, he was supervising hydraulic engineer for the division in charge of Central Valley Project studies and flood control and conservation investigations. From September, 1946, to November 1, 1951, he was principal hydraulic engineer of the Division of Water Resources, from which post he was elevated to Assistant State Engineer.

Waddell is a member of the American Society of Civil Engineers. He is a resident of Sacramento.

Jones Is Retiring

The Division of Water Resources will lose another of its top executives through retirement. Gerald H. Jones, Assistant State Engineer, will also retire on November 1st after more than 31 years of state service.

Jones, with headquarters in Sacramento, has over-all supervision of the safety of dams, the operation and maintenance of the Sacramento River Flood Control Project, flood damage repair programs, state hydraulic construction projects, snow surveys, the Sacramento-San Joaquin water supervision program, and beach erosion control.

He has been engaged in engineering work, both private and public, since 1911. About 31½ years have been spent in the service of the State of California. Other engineering work included 3½ years with East Bay Water Company on construction of San Pablo Dam and tunnels; two years with the City of Napa on Milliken Canyon Dam; two years as Chief Engineer and Manager of East Contra Costa Irrigation District; and six years on miscellaneous irrigation, water works and power developments, including Salmon Creek Dam in Alaska.

Jones is a native of California with San Francisco as his birthplace. He is a member and Past President of Sacramento Section, American Society of Civil Engineers.

W. A. Douglass

Walter A. Douglass, senior highway engineer with the Division of Highways Bridge Department in Sacramento, retired on August 25, 1955, culminating a 31-year career with the State.

At the time he retired Douglass was engaged in advance planning work for the Bridge Department. His job included maintaining close liaison with the 11 highway districts throughout the State. He had a responsible part in the preparation of the special report to the Legislature which culminated in the authorization of the Carquinez Bridge Toll Project.

Born in Iowa, Douglass attended school in Waterloo and Mt. Vernon. He studied engineering at Iowa University and Colorado Agricultural College.

He came to California in 1916 and went to work for the Division of Highways in 1921. He resigned in 1923 to enter private employment which included an assignment as assistant city engineer for the City of Eureka from 1924 to 1925. He returned to work for the division as a resident engineer on bridge construction in 1926. He was assistant bridge construction engineer from 1932 to 1937, later was assigned to administrative duties and finally in 1950 to advance planning.

Douglass is a member of the American Society of Civil Engineers and is also active in the Masonic Lodge and the Rotary Club. He has served on the State Olive Advisory Board and is Past President of the Fair Oaks Irrigation District.

Douglass and his wife live at 5648 Hazel Avenue in Fair Oaks.

Ralph Veach

On August 17, 1955, Ralph Veach, Division of Architecture Construction Supervisor, was honored at a retirement dinner in Los Angeles by fellow members of the division's Area III construction force. Mr. Veach retired after 21 years of service as a state employee.

Veach was born on October 21, 1885, in Terra Haute, Indiana. He attended Terra Haute public schools and studied civil engineering at Rose Polytechnic Institute. His first job was with the Overland automobile factory in 1903 during summer vacations.

Following his graduation, Veach ranched for himself in the Province of Saskatchewan, Canada. In 1910 he married Margaret McCloud of Winnipeg, Canada. They now have five children and 13 grandchildren, including two married granddaughters.

In 1915 Veach went to Los Angeles where he was associated with his brother in the contracting business. Later he was an inspector with the Los Angeles Board of Education. In 1934 he joined the staff of the Division of Architecture and for over two decades has served the State in the capacity of construction supervisor.

During World War II, Veach left the Division of Architecture, but returned later to supervise construction at the Pacific and Patton State Hospitals. In 1950 he was a roving inspector specializing in the supervision of construction of medium size construction projects, such as armories and Department of Employment branch office buildings. In 1953 he was assigned to assist with the supervision of construction of the new Fairview State Hospital near Costa Mesa, where he remained until he officially retired earlier this year.

San Jose Job

Lincoln Avenue Widening Major City Street Project

By HAROLD J. FLANNERY, City Engineer, City of San Jose

Like all California cities, San Jose has felt the impact of greatly accelerated growth in population with an accompanying increase in automobile traffic. This tremendous growth has created many complicated traffic problems. In an effort to alleviate these conditions, San Jose has undertaken a series of street openings and street widening projects. One of the most recent and important projects was the widening of Lincoln Avenue, a street in the Major City Street System, between Minnesota and Coe Avenues in the Willow Glen District. The improvement involved acquisition of rights of way by the city, and the widening and lighting contract financed by assessment proceedings and an allocation of gas tax funds. Various public utilities were participants also to the extent of revising and improving their facilities in conjunction with street widening. As a result, the city has added to its street system a modern thoroughfare with adequate lighting and a four-lane roadway with capacity to accommodate present and future traffic needs in a rapidly growing business district.

History

The City of Willow Glen consolidated with the City of San Jose in 1936. In October, 1949, a group of progressive businessmen submitted a petition for the widening, lighting and placing of all public utilities underground. Subsequently, in August, 1950, two similar petitions were submitted for the entire Willow Glen business district of Lincoln Avenue, for a distance of approximately one mile in length. The city realizing the importance of Lincoln Avenue as a main artery agreed to share part of the widening cost by the allocating of a portion of its gas tax money for the paving of the widened roadway; the property owners to assume the cost of the relocation of sidewalks, curbs, gutters and the lighting facilities. Also,

UPPER—Looking south from Lincoln and Coe Avenues before improvement. LOWER—Same location after improvement.

the cost of acquisition of right of way was to be borne by abutting property owners. The public utilities agreed to cooperate in the undertaking by assuming the cost of placing of all their facilities underground. Thus in 1952 assessment proceedings were commenced to acquire the necessary property; and in April, 1954, a contract was let to the A. J. Raisch Paving Company for the improvement of Lincoln Avenue by widening and lighting.

Details of Widening

The existing right of way was widened to provide for a 60-foot roadway with 10-foot marginal sidewalks.

Mercury-vapor luminaires were erected at 32-foot mounting heights and spaced on approximately 120-foot centers. Opposite spacings were employed to provide a method of decorating streets so as to avoid the need of anchors on the abutting buildings. Although staggered spacings would have produced a more evenly distributed light pattern, the maximum to minimum intensity of five to one in the roadway area is still within a reasonable amount to give excellent illumination. The average maintained illumination is 1.3 f.c.

Cost and Statistics

The cost of land acquisition to the property owners was $111,000. Contract and engineering costs totaled $137,500, of which the city contributed $55,700 from its gas tax funds. Relocation and underground work by the various utilities totalled approximately $200,000.

On October 5, 1954, the job was completed, and the lights turned on. Formal dedication was made on October 30, 1954, attended by state officials, city officials, and members of the Willow Glen Businessmen's Association.

The traffic count in June, 1953, was 9,000 A. D. T. After the opening, it increased to 14,000 A. D. T. as of July, 1955.

Plans were prepared under the supervision of Harry V. Miller, associate civil engineer, and the resident engineer was William Arthur Crane.

Normal business operations were carried on during the entire construction period, and this was only accomplished by excellent cooperation between contractors, engineers, and business men.

UPPER—Lincoln Avenue between Brace and Minnesota, looking south, before improvement.
LOWER—Same location after improvement.

Property owners are extremely pleased since the cost of the project to them has been more than offset by the increased value of their property.

Summing up the project it is an excellent example of the benefit that can be derived from the use of state gasoline gas tax funds to supplement local funds in the accomplishment of city street improvement.

SAN FRANCISCO CHAMBER OF COMMERCE URGES FREEWAY PROJECTS

Officials of the San Francisco Chamber of Commerce on August 17th submitted to the California State Highway Commission recommendations for highway improvement in the City and County of San Francisco which reflect the coordinated thinking of the Departments of Planning and of Public Works of the City and County of San Francisco, of major civic organizations, and of the Street, Highway and Bridge Section of the Civic Development Committee of the San Francisco Chamber of Commerce.

Recommended for construction and right-of-way allocation in the 1956-57 budget are the following projects with estimates of cost:

Bayshore Freeway, Third Street to south city limits, $560,000; Bayshore Freeway, south city limits to connection with existing Bayshore Freeway, near South San Francisco, $870,000; Embarcadero Freeway, completion from the San Francisco-Oakland Bay Bridge via the Embarcadero to Broadway at Battery and Sansome Streets, $5,400,000; 13th Street lateral, extension across Market Street from Mission Street to Turk and Golden Gate and Franklin and Gough Streets (included in this project are connections to Oak and Fell Streets), $7,900,000; Golden Gate Bridge approach, two additional lanes on US 101 from Richardson Avenue wye to junction with Sign Route 1 at Park Presidio intercharge, $4,000,000.

With Leonard S. Mosias presiding, officials of the San Francisco Chamber of Commerce entertained the highway commissioners and engineers of the Division of Highways at a luncheon at the Sutter Club in Sacramento following their appearance before the commission.

Pictured at the luncheon are: AT SPEAKER'S TABLE, *right to left*—Highway Commissioners Walter Sandelin, Ukiah; Fred Speers, Escondido; H. Stephen Chase, Sacramento; G. L. Fox, General Manager, San Francisco Chamber of Commerce; Leonard S. Mosias, Chairman, Street, Highway and Bridge Section, San Francisco Chamber of Commerce; Frank B. Durkee, Director of Public Works and Chairman of the Commission; Commissioners Chester H. Warlow, Fresno; Robert L. McClure, Santa Monica; James A. Guthrie, San Bernardino, and State Highway Engineer, George T. McCoy. AT END TABLE, *right to left*—Ralph Wadsworth, City Engineer of San Francisco; J. W. Vickrey, Assistant State Highway Engineer; Charles E. Waite, Assistant State Highway Engineer; H. Irving Rhine, San Francisco Chamber of Commerce; Harold V. Starr, Manager, Civic Development Department of the Chamber. FRONT ROW, *left to right*—J. C. Womack, Planning Engineer, Division of Highways; Arthur C. Jenkins, Chamber of Commerce; Milt Harris, Construction Engineer, Division of Highways; C. A. Maghetti, Secretary, Highway Commission. MIDDLE TABLE, *left to right*—C. M. Gillis, Assistant Deputy Director, Public Works Department; F. W. Panhorst, Assistant State Highway Engineer; Frank C. Balfour, Chief Right of Way Agent; J. E. Jellick, Chamber of commerce; A. J. Schlichtmann, General Petroleum; R. H. Wilson, Assistant State Highway Engineer; Robert E. Reed, Chief Counsel, Department of Public Works, and John P. Murphy, Public Relations Section, Division of Highways.

Jacob Dekema In New Post

Appointment of Jacob Dekema of San Bernardino as district engineer of District XI, State Division of Highways, succeeding E. E. Wallace, who retired August 31st, was announced by State Highway Engineer G. T. McCoy.

District XI, with headquarters in San Diego, comprises San Diego and Imperial Counties and the eastern half of Riverside County. For the past three years Dekema has been assistant district engineer of District VIII, with headquarters in San Bernardino.

JACOB DEKEMA

Dekema is a graduate of Los Angeles High School and of the University of Southern California, where he received his bachelor of science degree in engineering in 1937.

In 1938 he went to work for the Division of Highways and rose steadily through the ranks to become, successively, district construction engineer in District IX (Bishop), assistant construction engineer working out of division headquarters in Sacramento, and assistant district engineer (administration) of District VIII.

During World War II Dekema spent 2½ years on active Navy duty, specializing in aviation ordnance.

He is a member of the American Society of Civil Engineers and of the Elks and Mason Lodges. He and Mrs. Dekema have two children, Pamela, seven, and Douglas, three.

Max Gilliss Is New Deputy of Public Works

Director of Public Works Frank B. Durkee has elevated C. M. (Max) Gilliss, Assistant Deputy Director of the Department of Public Works, to a newly created position of deputy director. Gilliss' appointment under civil service laws is a temporary one, subject to a competitive civil service examination scheduled for October 15, 1955. Durkee said that expanding work in the department necessitated the creation of the new deputy position to assist in the development and coordination of administrative activities. In recognition of this need, the position was approved by the State Personnel Board and the Department of Finance.

Gilliss assumed the duties of special representative of the Department of Public Works on December 1, 1952. In August, 1953, he was named assistant deputy director.

Born and reared in Oklahoma, he took his college training at Riverside College, University of California at Los Angeles, and Oklahoma A. & M. at Stillwater, Oklahoma. In 1942 and 1945 he attended engineering and sales schools with International Business Machines Corporation, Endicott, New York. He is a licensed public accountant in California.

Gilliss went to work in 1937 at Riverside for a private corporation as operator and chief operator of its IBM accounting systems. In November, 1946, he first entered public service as a systems expert for Riverside County and chief of its central IBM accounting section.

With the advent of the Collier-Burns Act of 1947, he was named administrative assistant and attached to the Riverside Road and Survey Department. He represented Riverside County officials and the county board of supervisors before local and state agencies, taxpayer groups, state and local chambers of commerce, conventions, and legislative hearings.

Visiting Engineers Study Highways In California

Twenty-five engineering instructors from colleges and universities in 20 states of the Union and two foreign countries, spent six weeks in California this summer in advanced study in the highway engineering field.

DR. T. E. H. WILLIAMS

Most of the visitors' time was spent in an intensive course at the Institute of Transportation and Traffic Engineering at the University of California. Field trips covered the freeway and other highway developments in the San Francisco Bay area and the Los Angeles metropolitan area.

Another field trip included a tour of the Division of Highways Headquarters Office at Sacramento.

One of the visiting instructors, Dr. T. E. H. Williams of Newcastle Upon Tyne, England, returned to Sacramento for more detailed study before leaving in mid-August for eastern metropolitan centers and subsequently for his home. He is head of the highway engineering and traffic studies section of the Department of Civil Engineering at King's College of the University of Durham.

In addition to attending the I. T. T. E. course, Dr. Williams has been making a special study of urban freeways in the United States at the request of the British Road Federation and the Rees Jeffreys Road Fund. He was interested in all aspects of California's freeway program.

Beer Joins District VIII

Charles G. Beer has been assigned as assistant district engineer-administration in District VII, succeeding Jacob Dekema who was transferred to District XI as district engineer.

Beer went to San Bernardino from the Los Angeles office where he served as traffic engineer for a number of years.

Southern Tour

Highway Commission Visits Five Southland Counties

By C. A. MAGHETTI, Secretary, Highway Commission

FOLLOWING a custom of several years standing, the California Highway Commission recently completed a business session in Los Angeles and a tour of several southland counties for the purpose of viewing highways and to hear presentations from various civic organizations for highway improvements during the 1956 period.

The task of maintaining and improving California's thousands of miles of highways is gigantic and continuous. With automobile registrations mounting at an accelerated rate, never-ending problems seem to multiply faster than the cure and although millions of dollars are expended annually, the dollars are still insufficient to cover the needs.

With the purpose in mind to bring the Highway Commission in closer contact with these problems in the thickly populated southland, the California State Chamber of Commerce and the Southern California Highway Committee joined forces to prepare a tour of inspection interspersed with luncheon and dinner meetings at which it was possible for civic groups to report directly to the commissioners the pressing problems of their particular area.

Five Counties Visited

The commissioners, busy men in their own vocations, set aside the week of July 18-22, 1955, to conduct the regular monthly business meeting and the inspection tour. During this period visits were made to the Counties of Ventura, Los Angeles, Orange, Riverside and San Diego. In every section, it was observed new homes were being constructed with mushroom rapidity.

As each home meant that a new family would occupy it, and as the average family of today owns at least one automobile, the ultimate result serves to create a greater strain and stress on existing highways.

To see all of this once again, the commission set forth from the district office in Los Angeles on July 18, 1955, to travel the Hollywood Freeway through the San Fernando Valley to the Golden State Freeway Project and thence over Route 79 to Ventura and Oxnard where luncheon was served by the joint Ventura and Santa Barbara County interests. Here the first presentation of highway needs for 1956 were heard by the commission.

Following luncheon the tour continued on to Santa Monica for dinner and the reception of proposed highway projects by the Santa Monica Chamber of Commerce.

Back to Los Angeles on Tuesday.

The regular monthly business session of the commission was held that day with Wednesday set aside to hear presentations by various groups.

All Commissioners Present

Those present included Frank B. Durkee, Director of Public Works and ex officio Chairman of the California Highway Commisison; and Commissioners Chester H. Warlow, Fresno; James A. Guthrie, San Bernardino; H. Stephen Chase, Sacramento; Robert McClure, Santa Monica; Walter Sandelin, Ukiah; Fred W. Speers, Escondido; and Chelso A. Maghetti, Commission Secretary.

From the Division of Highways present were: F. W. Panhorst, Assistant State Highway Engineer; J. W. Vickrey, Assistant State Highway Engineer; R. H. Wilson, Assistant State Highway Engineer; C. E. Bovey, Engineer of City Projects; J. C. Womack, Planning Engineer; J. P. Murphy, Principal Highway Engineer; Frank C. Balfour, Chief Right of Way Agent; E. F. Wagner, Deputy Chief Right of Way Agent; and members of the Los Angeles District Office.

In the evening, members of the commission and staff and the Division of Highways were dinner guests at the University Club hosted by the Los Angeles Chamber of Commerce Downtown Business Men's Association, and the Metropolitan Transportation Engineering Board. The dinner concluded with a hearing of the needs of the busy Los Angeles area.

Wednesday the commissioners devoted the morning to public hearings when interested persons appeared and presented their roadway problems. At the end the commisison met to consider one of the presentations and to render a decision.

A buffet luncheon at noon in the patio of the Los Angeles office of the State Chamber of Commerce was thoroughly enjoyed.

Business and pleasure followed in the afternoon. With the completion of fabulous Disneyland, new traffic problems in the area presented them-

(1) Dinner meeting at Escondido, home town of Commissioner Fred Speers. Left to right—C. A. Maghetti, Secretary; Frank B. Durkee, Director of Public Works and Chairman of the Commission; Commissioners James Guthrie, San Bernardino; Fred Speers, Escondido; Robert McClure, Santa Monica; Edward Wallace, District Engineer, San Diego; and Commissioner H. Stephen Chase, Sacramento.

(2) The stop at Corona where members of the tour were met by city officials and served cooling lemonade.

(3) Listening to the presentation of highway needs at Anaheim by Kenneth Kendrick, Vice Chairman of the California State Chamber of Commerce Highway Committee.

(4) Director Durkee addressing the meeting at Anaheim. Among those seated at the head table are Robert McClure and on the other side of the speaker Commissioners Chase and Speers.

(5) The meeting at Los Angeles. The main dining room of the University Club was filled to capacity.

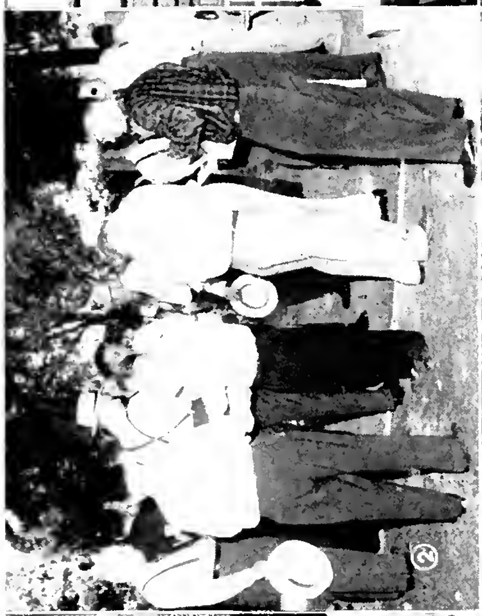
(6) Just before the meeting in Riverside. Conversing in the patio of the famous Riverside Inn may be seen in the central distance, Commissioner Guthrie. In the right foreground are Kenneth Kendrick and Commissioners Speers and Chase.

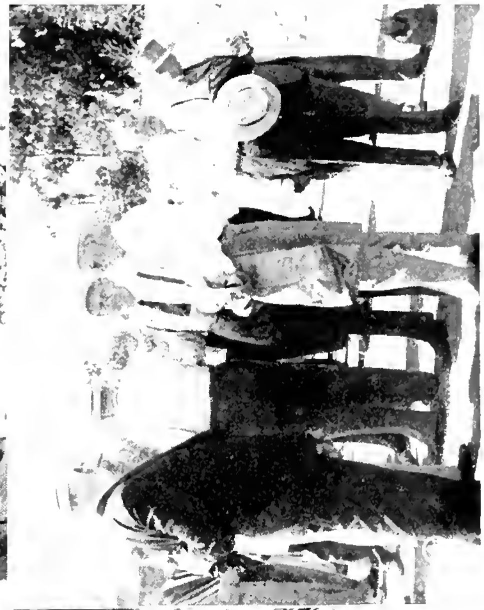
(7) Inspecting the overpass in the City of Colton. Left to right, two city officials and Director Durkee, Commissioners Speers, Guthrie, Chase and Chester Warlow.

(8) A look at the highway. At the extreme left Commissioner Speers, with right side showing; Commissioner Guthrie; back to camera, Chester Warlow. Facing camera, Stephen Chase, Carl Fennema, Downtown Business Men's Association, Los Angeles, and C. A. Maghetti, secretary.

(9) Another highway inspection stop. On the Santa Ana Freeway looking towards Disneyland in the far distance.






selves. The commissioners viewed the situation and were later guests of the management for a tour of that wonderland.

In the evening the Associated Chambers of Commerce of Orange County presented the 1956 projects at the dinner meeting in Anaheim. The night was spent at the Balboa Bay Club.

Thursday morning the schedule read "Leave Orange County via Brea Canyon to inspect the proposed Brea Canyon Freeway, thence to Pomona and over the new freeway to Colton and south to Riverside." Hosts at the luncheon in the famous Riverside Inn were the Riverside County Board of Trade and San Bernardino civic interests. Pressing problems of the area were presented.

Dinner at Escondido

A stop was made at Corona where the mayor and other officials favored the commission with refreshing lemonade in the city park, after which the tour continued on to Escondido via State Route 71 and US 395.

At Escondido, the chamber of commerce in cooperation with northern San Diego civic organizations hosted the dinner and presented their 1956 requirements.

The tour came to an official end following the luncheon at the Hotel El Cortez, which was sponsored by the San Diego Chamber of Commerce, the San Diego Downtown Association, and the Highway Development Association.

In retrospect, the tour which followed the business sessions of the commisison, was a decided success. Its value was further magnified because it provided the opportunity for the commission members to see at first hand, not only work which was completed, but also that which is on the drawing boards and under future consideration.

Furthermore, it emphasizes that much is yet to be done even though California undoubtedly leads the Nation with its 14,000 miles of highway.

The need for bigger, wider, and better highways is readily recognized by the commission. Its greatest task is to distribute the funds it has wisely and for the greatest good to the greatest number.

State Chamber Recommends Highway Projects

SPEAKERS AT STATE CHAMBER LUNCHEON. LEFT—F. W. Tarr, Chico, Vice Chairman of State-wide Highway Committee. CENTER—Director of Public Works Frank B. Durkee. RIGHT—James Musatti, General Manager of State Chamber.

Recommendations for 492 highway improvements in all parts of California were submitted to the Highway Commission for consideration in the preparation of its 1956-57 budget by the California State Chamber of Commerce on August 18th.

One of the continuing activities of the state chamber has to do with the coordinating efforts which result each year in compilation of highway construction project recommendations.

The chamber's 500 state-wide and regional highway committeemen, local governmental officials, local chamber of commerce executives, civic associations and a multitude of interested individuals participated in assembling those projects that merit early consideration by the commission.

Following presentation of its recommendations officials of the State Chamber of Commerce tendered a luncheon to the highway commissioners and engineers of the Division of Highways at the Sutter Club in Sacramento.

Los Angeles Makes Recommendations

Spearheaded by Matt English of the Los Angeles Chamber of Commerce and Robert M. Shillito, General Manager of Downtown Business Men's Association, representatives of those two organizations and other civic groups, submitted to the California Highway Commission on September 22d a list of freeway projects in the Los Angeles metropolitan area which they urged be recognized in the 1956-57 budget for additional allocation to finance extensions.

The recommendations were signed by: Carl P. Miller, President, Los Angeles Chamber of Commerce; Burton C. Rawlins, President, Downtown Business Men's Association; Robert Mitchell, President, Los Angeles Metropolitan Traffic Association; Charles Bennett, Chairman, Metropolitan Engineering Board; Lloyd Aldrich, City Engineer, City of Los Angeles; Ernest E. East, Chief Engineer, Automobile Club of Southern California; J. T. Blalock, President, Los Angeles Chapter, National Safety Council; William B. Cleves, Chairman, Los Angeles Traffic Advisory Board.

Projects on which acquisition and construction should be completed which were recommended by the delegation are:

	Miles
(1) *Olympic Freeway*—State Route 173 Santa Ana Freeway to Hoover Street	4.4
(2) *Long Beach Freeway*—State Route 167 Atlantic Boulevard (North Jct) to Compton Boulevard	7.3
(3) *Harbor Freeway*—State Route 165 92d Street to Pacific Coast Highway	11.4

	Miles
(4) *Ventura Freeway*—State Route 2	
Hollywood Freeway to Los Angeles city boundary near Calabasas	14.8
(5) *Golden State Freeway*—State Route 4	
From Santa Ana Freeway to Hollywood Freeway	19.4
(6) *Hollywood Freeway*—State Route 159	
Lankershim Boulevard to Golden State Freeway	6.8
(7) *San Diego Freeway*—State Route 158	
Burbank Boulevard to Venice Boulevard	12.0
Harbor Freeway to Long Beach Freeway	5.0
(8) *Allesandro-Glendale Freeway*—State Routes 162 and 61	
Colorado Freeway to Glendale Boulevard	4.9
Total	86.0

"The projects," a spokesman for the delegation said, "are not listed in any order of priority, however, it has been unanimously agreed by us that the most important link at this writing is the section of the Olympic Freeway from the Santa Ana Freeway to the connection with the Harbor Freeway. We respectfully urge that all other projects be undertaken as rapidly as possible."

SEATED AT LUNCHEON, LEFT TO RIGHT: A. S. Koch, Orange County Road Commissioner; Supervisor Heinz Kaiser, Orange County; H. B. LaForge, J. C. Young, Division of Highways; C. A. Maghetti, Secretary, Highway Commission; Frank C. Balfour, Division of Highways; Commissioner James A. Guthrie; Lew A. Arnold, Deputy City Engineer of Los Angeles; Robert E. Reed, Division of Contracts and Rights of Way; E. E. East, Automobile Club of Southern California; State Highway Engineer George T. McCoy; Public Works Director Frank B. Durkee; James Munroe, Los Angeles Chamber of Commerce; Commissioner Robert E. McClure; John S. Ward, Downtown Business Men's Association; Commissioner H. Stephen Chase; Sam Kennedy, Los Angeles County Road Commissioner; Commissioners Chester H. Warlow and Walter Sandelin; George N. Cook, Assistant Secretary, Highway Commission; William Cleves, Chairman, Los Angeles Traffic Advisory Board; Walter Lindersmith, Los Angeles Metropolitan Traffic Association; J. C. Womack, Planning Engineer, and Assistant State Highway Engineer F. W. Panhorst. STANDING, LEFT TO RIGHT—Robert M. Shillito, General Manager, Downtown Business Men's Association; Deputy Public Works Director Max Gilliss; Douglas McKenzie, City Engineer, Pasadena; Lloyd Braff, General Manager, Los Angeles Traffic Department; Matt English, Los Angeles Chamber of Commerce.

Dirt-moving Job

A large dirt-moving highway project in Northern California this year is the three-mile realignment of U. S. 299 from the Trinity River easterly up a 6 percent grade toward Redding, 30 miles away.

Earl L. McNutt Company of Eugene, Oregon, outbid 11 other contractors, including three other Oregon firms and one Los Angeles outfit, to land the $586,134 contract.

McNutt's bid for 780,000 cubic yards of roadway excavation was 26½ cents per cubic yard—a price which requires a highball operation.

The existing road has 82 curves, 30 of them reversing. The new alignment will cut the mileage from 4.5 miles to 3.02 miles. Because of the large amount of logging and lumber truck traffic, the road has a high traffic index.

The new 32-foot roadway parallels the existing road for nearly two miles, then through two deep cuts eliminates two large loops in the existing roadway. There will be more than 15,000 cubic yards of excess excavation.

Oregon Caves National Monument

On an August day in 1874 Elijah Davidson was out after bear in the Siskiyou Mountains of Southern Oregon. After some beating around in the bush he managed to spot a bear and wounded it. The wounded bear, however, disappeared into an opening in the rocks and Elijah, armed with a torch and his rifle, followed after it. He thus became, according to the National Automobile Club, the first white man to happen across the natural wonder that has since come to be known as the Oregon Caves National Monument.

The story of these vast caves is one that starts far back in the ages. It starts back at a time when some ancient ocean that then covered the land was depositing great layers of lime, which later hardened into limestone. Under terrific heat and pressure generated within the earth this limestone was turned to marble and the whole area was thrust up above the surface of the sea and formed into what is now known as the Siskiyou Mountains. Rain fell and mixed with decaying vegetation to form carbonic and other acids, and this acid ran through the fractures formed in the marble during the period of upheaval to carve out the great tunnels that became the Oregon Caves.

As the acid water ate away the marble in one place it would deposit it in another. As the water dripped slowly from the ceiling it would evaporate slightly before falling and leave some of the lime it was carrying as a deposit. And as it struck the floor and evaporated it would deposit more lime there. In this way the fantastic stalactites and stalagmites were formed, hanging icicle-like from the ceiling, rising cone-like from the floor. Often these stalactites and stalagmites would join together to form strange natural columns in the underground caves.

CABLE CARS

The first successful test of cable cars in San Francisco was made on Clay Street in August, 1873, according to the National Automobile Club.

Large Allocation For Sherwin Hill

The California Highway Commission has voted an allocation of $1,515,000 to relocate a 12-mile section of U. S. Highway 395 (Three Flags Highway) north of Bishop, Inyo County, to eliminate the steep pitches and sharp curves in the vicinity of Sherwin Hill and Rock Creek Grade.

Plans of the Division of Highways call for the consruction of a modern, two-lane highway over this section. The allocation is the largest ever made for a single state highway project in Inyo and Mono Counties.

The commission adopted a routing for the relocation in September, 1954. The route extends from Birchim Canyon, about 12 miles north of Bishop, to Whiskey Canyon, south of Tom's Place in Mono County. Tom's Place is approximately 65 miles south of Bridgeport, Mono County.

The new route runs easterly of the existing highway on a generally parallel course. For most of its length it follows the east mesa between Rock Creek and the Owens River.

The allocation was made as an addition to the state highway budget for 1955-56.

BARNEY OLDFIELD DRIVES FOR HENRY FORD

Few scenes in the history of the American motor car are quite so memorable as the one that took place near Salt Lake City around the beginning of this century, points out the National Automobile Club.

Mechanics and helpers rolled out on the sands the giant "999," a racing car that Henry Ford and his friends had built to beat all comers. Barney Oldfield took his place behind the wheel, Henry stepped to the front of the car and cranked it while Barney waggled the choke, the car started with a roar, the earth shook, and the race car was about to get under way.

"This chariot may kill me," the one-time champion bicycle racer was reported to have said as he chewed on his dead cigar, "but they will say afterward that I was going like Hell when it took me over the bank!"

The old "999" never took Barney over the bank. He won by half a mile.

Future Freeway Is Given Name Of Glendale

The California Highway Commission has named a future freeway in the Los Angeles-Glendale area the Glendale Freeway.

The route of the proposed freeway, formerly unofficially referred to as the Allesandro Freeway, extends from the Hollywood Freeway in the vicinity of Vermont Avenue to Foothill Boulevard in the vicinity of La Canada and Montrose.

A new routing has been adopted for only one mile of the ultimate 10-mile freeway. This is the portion between the Los Angeles River near Fletcher Drive and Avenue 36 near Eagle Rock Boulevard. The new route runs several hundred feet south of and generally parallel to Fletcher Drive.

The Glendale Freeway, when its entire location is eventually determined, will include portions of State Highway Route 162 and Sign Route. These routes now follow Hyperion Avenue, Rowena Avenue, Fletcher Drive, Verdugo Road and Canada Boulevard.

The commission said its action in naming the Glendale Freeway was taken at this time to forestall confusion in future public announcements and discussions concerning the freeway routing. The commission assigns names to freeways on the State Highway System for the purpose of providing directional information to the traveling public.

NEW NAPA RIVER BRIDGE

Division of Highways has applied for the Army Department's approval of plans for construction of a new four-lane highway bridge across Napa River.

The structure would replace the existing highway bridge at Vallejo and would be a high-level fixed-span reinforced concrete structure supported on a series of concrete column bents with the channel span supported on concrete piers and footings.

The main channel span would have a horizontal clearance of 140 feet between fenders and vertical clearances of 100 feet above mean higher high water and 106 feet above mean lower low water.

Hatchet Mountain Job

Improvement of US 299 between Redding and Alturas this year includes two major realignment projects—(1) the Montgomery Creek Double Loop project, and (2) five miles from Debs Place to the summit of Hatchet Mountain.

Fredrickson & Watson Construction Company of Oakland was awarded the Hatchet Mountain job on its bid of $555,355.55.

The 8,000 feet on the west of the Little Hatchet Creek bridge followed the existing roadway and the work consisted largely of making the grade more uniform although for one short section a four-lane roadway was built to permit passing.

At Little Hatchet Creek the existing bridge is being replaced with a reinforced concrete box culvert 62 feet long. The channel is also being changed.

After crossing Little Hatchet Creek the new alignment crosses the existing way several times up a continuously rising grade varying from 1.3 percent to 5 percent. Approximately 85 percent of the roadway excavation is in this section.

MOTOR VEHICLE REGISTRATIONS

According to an estimate of the Bureau of Public Roads, motor vehicle registrations in the United States are expected to reach 61,301,000 in 1955. The estimate, based on reports of state registration agencies, indicates a gain of 4.6 percent compared with 1954 motor vehicle registrations.

Passenger cars are expected to total 50,954,000, a 5.1 percent increase compared with 1954. Trucks and busses will total 10,347,000, a gain of 2.8 percent. Florida leads the states in expected total increase in registrations with 10 percent, and Texas is second with an expected gain of 7.1 percent. The total of motor vehicles is expected to reach 81,000,000 by 1965.

MOTOR TRUCKS AND BUSSES

United States factories produced 700 motor trucks and busses in 1904, according to the National Automobile Club.

BY-PRODUCTS OF THE FREEWAYS

The primary objective of freeways is to expedite the flow of large volumes of traffic as safely as possible. Beyond that freeways are producing some beneficial by-products and it is with these that Paul O. Harding, Assistant State Highway Engineer, has concerned himself in an article in *California Highways and Public Works.*

Developed Areas

Freeways, Mr. Harding says, have played a conspicuous part in the development of areas which they traverse. They have improved park areas, he says; they have helped to beautify the city, particularly in older sections where decrepit buildings have been moved from their paths, and they are assisting in erosion control through the State Division of Highways protective planting program.

Some persons are bound to take issue with the claim for park improvement: the long contention over routing the Golden State Freeway through Griffith Park exhibits the disagreement. But Mr. Harding insists that existing parks will finally be benefited by freeway development rather than damaged.

Additional Park

The Hollywood Freeway location between Bellevue Avenue and Temple Street is cited. This had to pass through a part of Echo Park, but under an agreement between the State and the city, additional park land was acquired to compensate for the land required by the freeway.

In addition the State assumed the job of reconstructing playground facilities which had been in the path of the freeway, replacing, among other things, a baseball diamond. The new one has bleachers and night lighting. In other cases, too, restored facilities were improvements over the originals.

In the Eagle Rock playground area where land was required for the Colorado Freeway, another agreement between city and State produced advantages for both parties. The agreement required the State to assist in building up low levels of parkland with earth from freeway excavations. So far, 65,000 cubic yards of material have been used on this project which will eventually be the scene of tennis courts and other playground facilities.

Arroyo Seco Parkway is one of the best examples of the erosion control program through multipurpose planting. Originally the route was a boulder-strewn river bottom. The planting of a decade and more has transformed the highway to a pleasing park. And there is the added insurance against disastrous floods given by the thick cover that clings to the hills on both sides.

Beauty Is By-product

At the Atlantic Boulevard interchange on the Santa Ana Freeway, the ice plant that greens the slopes is not primarily for esthetic purposes. Beauty is a by-product; what the ice plant actually does is save many thousands of dollars that would have to be spent on maintenance.

Freeway development has met and will continue to meet opposition, even though it is generally agreed that it is the best solution for our critical traffic problems.

Mr. Harding recognizes this. He says: "Freeway development has a terrific impact on the communities passed through. Literally thousands of people have their homes, their businesses, and their institutions torn up by the roots. Money payments to owners based on fair market values for property taken cannot always compensate some individuals for sentimental attachments. The freeway program goes forward on the premise that there is accomplished 'a greater good for a greater number.' "—Editorial in Los Angeles Times.

TWO DANGER POINTS

More serious traffic accidents result from two causes than from all others, says the California State Automobile Association. These are improper passing and driving too fast for conditions. Be sure there's a margin of safety when you pass another car, and use good judgment in regulating your driving speed.

Highway Division Engineer Elected Director of ASCE

R. Robinson Rowe, supervising bridge engineer for the State Division of Highways, will be installed as an American Society of Civil Engineers director at the organization's convention in New York City October 24-28.

New president of the ASCE will be Enoch R. Needles, New York, senior partner of Howard, Needles, Tammen & Bergendoff.

The installation of officers will take place October 26 during a morning business meeting.

Rowe was born in 1896, graduated from Harvard University in 1916, took a B.S. in engineering in 1918 and another B.S. that same year from the Massachusetts Institute of Technology.

Following college, he worked for a time with the United States Geological Survey and Southlands Corp. In 1926, he was a construction engineer in the firm of Allan & Rowe, San Diego. He was an associate engineer on the San Francisco-Oakland Bay Bridge project in the mid-1930's.

Since 1938, Rowe has been the division's supervising bridge engineer. He is well known in the ASCE for his numerous technical articles and served as president of the organization's Sacramento Section at one time.

At the same business session the Rudolph Hering Award will be presented to W. F. Langelier, professor of sanitary engineering, University of California, Berkeley; Russell G. Ludwig, consulting engineer, El Monte, and to Harvey F. Ludwig, Washington, D. C., sanitary engineer.

Other Californians will receive awards. The Arthur M. Wellington Prize will go to R. J. Ivy, bridge engineer, State Division of Highways, Sacramento; T. Y. Lin, professor of civil engineering, University of California, Berkeley; Stewart Mitchell, consulting engineer, Sacramento; N. C. Raab, project engineer, San Francisco Bay Toll Crossings, Berkeley; Vernon J. Richey, senior bridge engineer, Bay Toll Crossings, Berkeley; C. F. Scheffey, department of civil engineering, University of California.

RETIREMENT OF BAY BRIDGE BONDS BENEFITS HIGHWAY FUND

With Governor Goodwin J. Knight presiding as chairman, the California Toll Bridge Authority on October 4th took action which will authorize the retiring of all of the presently outstanding bonds of the San Francisco-Oakland Bay Bridge and which will also effect by June 30, 1957, reimbursement to the State Highway Fund of the moneys advanced for operation and maintenance of the bridge since its inception as now provided by law.

There are sufficient funds on hand from bridge income so that by reducing the reserve fund of the bridge from $25,000,000 to $15,000,000, as is permitted by the existing bond resolution, retirement of all outstanding San Francisco-Oakland Bay Toll Bridge Revenue Bonds and repayment to the highway fund can be acomplished.

Highway Fund Benefits

"The State Highway Fund, particularly the portion by law allocated to the 45 northern counties," the Governor said, "will benefit immediately by our action by the addition of approximately $6,000,000 to the budget for the 1955-56 Fiscal Year and $11,000,000 to the budget for the 1956-57 Fiscal Year and will also be relieved of expenditures for the maintenance of the bridge now being paid from the State Highway Fund amounting to approximately $1,000,000 a year.

"This will enable the State Highway Commission to consider allocating in its current and 1956-57 budgets approximately $17,000,000 to be spent in the 45 northern counties of the State from whose share of the funds maintenance, insurance and operation costs have been paid in the past. Projects in the 1956-57 budget, under new legislation, can be let to contract beginning January 1, 1956."

Repayment to Highway Fund

Redemption of the outstanding bonds now will eliminate them as one of the major obligations that must be met in financing a Southern Crossing. By reason of legislation adopted at the 1955 session of the Legislature, tolls must be continued on the bridge at rates substantially equivalent to those in effect on January 1, 1955, for the purpose of accumulating funds to reimburse the State Highway Fund for expenditures heretofore made for maintenance and operation of the bridge and to build up a reserve for the construction of the Southern Crossing, which will be aided by the authority action due to the savings in interest on the bonds which will be effected, the Governor pointed out.

Repayment to the Highway Fund is required by the Southern Crossing legislation enacted in 1953, so that no delay in construction of the Southern Crossing is involved.

Existing law enacted in 1953 requires that at the time the Southern Crossing financing takes place sufficient bonds be issued to retire all of the presently outstanding bonds and to pay off the Highway Fund in cash. The effect of the present retirement of the bonds, and commencement of the repayment to the State Highway Fund, will reduce the amount of bonds that will have to be issued for the Southern Crossing.

The action of the authority will result in advancing the construction dates of a number of badly needed highway projects at least a year.

Parallel Carquinez Bridge

The authority also adopted a bond resolution authorizing the issuance of up to $80,000,000 of revenue bonds to finance the construction of a new parallel Carquinez Bridge, a Benicia-Martinez Bridge, improvements to the existing Carquinez Bridge, and extensive approaches to both of the new bridges.

The resolution provides for an initial issue of $46,000,000 to finance the new Carquinez Bridge and an approach on the southerly end of the bridge to Hercules. The action contemplates a second series of up to the remaining $34,000,000 approximately a year from now to provide funds to build the Benicia-Martinez Bridge, improve the existing bridge, and to complete the approaches, particularly through the City of Vallejo, to the Carquinez Bridge.

Calls for bids on the construction contracts of the new Carquinez Bridge, its toll plaza, and the southerly approach to Hercules will be published in the near future. It is contemplated that bids will be opened about the first of December on this construction work and the bonds sold pursuant to competitive bidding about December 13th.

Richmond-San Rafael Bridge

Pursuant to Chapter 159, Statutes of 1955, the authority approved and authorized the execution of an agreement between the Department of Public Works and the Department of Finance, whereby funds up to $6,000,000 necessary to complete the lower deck and the connecting approaches to the Richmond-San Rafael Bridge will be borrowed from the State School Land Fund.

When the Richmond-San Rafael Bridge was originally financed it was contemplated that the lower deck would not be commenced until several years after the bridge was opened to traffic. However, due to anticipated greater traffic and the economies that can be effected in construction, it was deemed desirable to proceed with the construction of the lower deck at this time. It is estimated it will be completed about a year after the upper deck is opened to traffic in the fall of 1956.

The borrowed funds will be repaid with interest out of any new or refunding bond issues on the bridge that may be issued or, if no bonds are issued, from tolls after the presently outstanding bonds are retired.

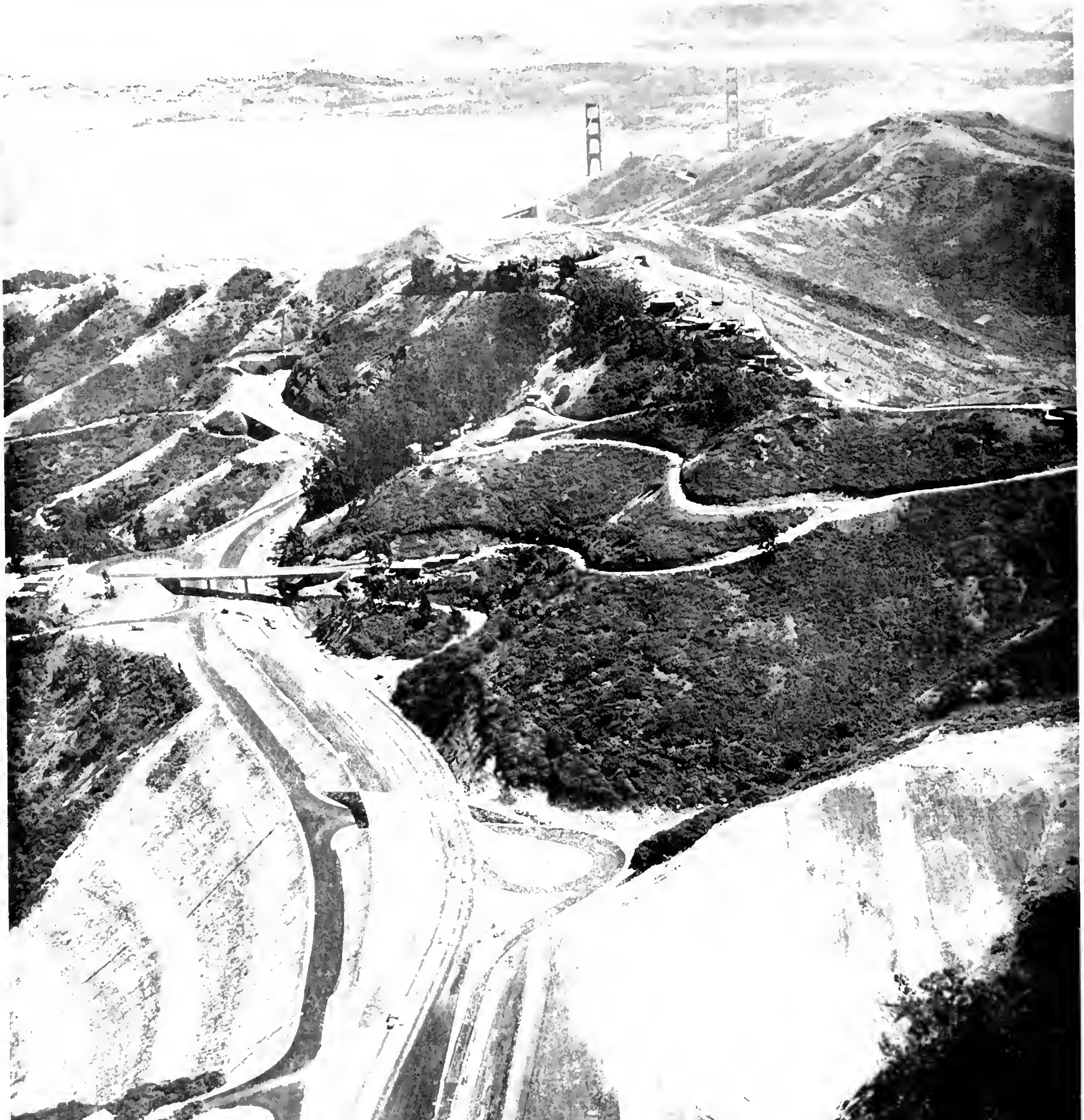
Carquinez Bridge Engineer

Leonard C. Hollister of Sacramento, Principal Bridge Engineer for the State Division of Highways, has been named coordinator for the parallel Carquinez Bridge and approaches project.

The engineer will work under G. T. McCoy, state highway engineer, and his assistants, F. W. Panhorst and V. W. Vickery.

PHOTOGRAPHIC SECTION KEEPS PICTORIAL RECORD OF HIGHWAY PROGRESS

This is the new Orinda Interchange on Sign Route 24 in Contra Costa County



Recent aerial view of new Waldo approach to Golden Gate Bridge looking toward San Francisco. Picture graphically shows size of cuts. On September 28 both north and south bound traffic was routed through new east Waldo tunnel pending remodeling of the old bore which will require about three months.

Construction operations on Bayshore Freeway from Third Street Interchange in foreground. Looking southerly along open water fill toward Sierra Point. The Division of Highways is advertising for bids on a project which will complete all rough grading and structures required to close the overwater gap on the freeway.

State Highway Contracts Awarded

JULY, 1955

Lake, Mendocino, Humboldt, and Trinity Counties—At various locations, apply seal coats, 69.0 miles. Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $76,350.

Modoc County—US 395—Between Pit River Bridge and Route US 299, on Main Street. Construct new curbs and gutters, and revise street intersections and drainage facilities, 8,000 lineal feet. Contract awarded to Marion V. Allen, Redding, $42,481.02.

Plumas and Tehama Counties—At various locations, apply seal coats, 10.3 miles. Contract awarded to I. J. Ely Co., Larkspur, $14.580.

Siskiyou County—US 99 and US 97—At various locations, apply seal coats, 18.1 miles. Contract awarded to I. J. Ely Co., Larkspur, $17,075.45.

Siskiyou County—SR 96—Across Klamath River, about 16 miles east of Hamburg. Construct steel towers and anchorages for a pipeline suspension bridge. Contract awarded to Trinity Construction Co., Redding, $5,927.30.

Siskiyou County—SR 82—Between Fort Jones and Moffet Creek. Grade, place cement treated base and surface with plant-mixed surfacing, partially on new alignment, and construct a reinforced concrete bridge, 5.6 miles. Contract awarded to Clements Const. Co. and Ronald D. Coats, Centerville, $469,-529.95.

Colusa County—FAS 758—Between 10 miles north of Colusa and Butte county line. Place imported base material and apply a prime and double-seal coat, 7.1 miles. Contract awarded to D. Gerald Bing, Carmichael, $93,230.

El Dorado County—FAS 1187—Between Weber Creek Bridge and Four Corners, and between Lotus and Mother Lode Highway. Construct a graded roadbed, 2.9 miles. Contract awarded to C. V. Kenworthy, Stockton, $107,484.

Glenn County—FAS 761 and 1119—Between Colusa county line and SR 45, and between County Road P and SR 45. Construct a graded roadbed with imported subbase material and place plant-mixed surfacing on untreated base at one location and place imported base material at second location, constructing road approaches. Contract awarded to Harms Bros., Sacramento, $164,381.

Nevada County—FAS 1220—Across Deer Creek, on Mooney Flat Road, about 1.5 miles north of SR 20. Construct a welded steel bridge. Contract awarded to F. H. Thomas Co., Sacramento, $37,949.

Sacramento, Yolo, El Dorado, Placer, Colusa, Sutter, Yuba, Nevada, and Glenn Counties—At various locations. Apply seal coat to the existing surfacing, 50.0 miles. Contract awarded to A. Teichert & Son, Inc., Sacramento, $54,602.50.

Alameda County—Between 10th Street and the distribution structure, on Eastshore Freeway. Construct a portion of a double deck, reinforced concrete bridge, construct a graded roadbed, place pavement and surfacing, place plant mixed surfacing on the detour bridge, place light weight plant mixed surfacing on a portion of the existing structure, construct channelization connections and approaches, construct a detour bridge and construct traffic control facilities. Contract awarded to Grove Shepard, Wilson & Kruge of Calif., Inc., Seattle, $5,878,249.

Santa Clara County—US 101 Bypass—At Agnew Underpass. Reconstruct pump plant. Contract awarded to Lew Jones Const. Co., San Jose, $4,216.

San Mateo County—US 101—Between Victoria Avenue and Rosedale Avenue, grade and pave with plant mixed surfacing on cement treated base and existing pavement, completion of which provides a six lane divided highway with traffic signal and highway lighting systems, 0.9 mile. Contract awarded to L. C. Smith Co., San Mateo, $253,-958.50.

San Mateo County—SR 5—Between 3.5 miles north of Alpine Road and 1.8 miles south of La Honda Road. Place untreated base over the existing traveled way and shoulders, surface with plant-mixed surfacing and apply seal coats, 1.3 miles. Contract awarded to O. C. Jones and Sons, Berkeley, $44,688.

San Mateo County—US 101 Bypass—Between San Francisco Airport Interchange and 0.4 mile north of Broadway Interchange. Grade an off ramp and two detours and surface with plant-mixed surfacing on untreated base, construct two reinforced concrete box culverts, relocate existing electroliers and modify the existing sign lighting, 0.7 mile. Contract awarded to O. C. Jones & Sons, Berkeley, $135,854.80.

Sonoma County—SR 1—Between Jenner and Mendocino county line. Furnish and install new drainage facilities. Contract awarded to Thomas Const. Co., Fresno, $52,907.

Fresno County—Between Broadway and P Street, on Stanislaus and Tuolumne Streets; and between Divisadero Street and Ventura Street, on O and P Streets. Construct a graded roadbed, place plant-mixed surfacing on cement treated base and on the existing pavement and apply seal coats, 1.4 miles. Contract awarded to Gene Richards, Inc., D. M. Underdown & Gene Richards, Fresno, $147,000.

Kern County—US 99 and US 399—Between Bakersfield and Lerdo and between SR 139 and Greenfield. Apply seal coats, 17.5 miles. Contract awarded to Howard B. Folsom, Westwood, $15,525.50.

Kern County—FAS 887—Between main canal and China Grade loop, on Manor Street. Construct a graded roadbed, surface with plant mixed surfacing on cement treated base and construct a steel bridge at Beardsley Canal and a reinforced concrete bridge at main canal, 1.8 miles. Contract awarded to Griffith Co., Los Angeles, $215,882.40.

Tulare County—SR 65—Between 1.5 miles north of Deer Creek and Linda Vista Avenue, near Porterville. Construct graded roadbeds, place plant mixed surfacing on cement treated base and existing pavement and install a highway lighting system, 7.7 miles. Contract awarded to Stewart & Nuss, Inc., Fresno, $455,537.

Tulare County—FAS 1130—Between Avenue 48 and Avenue 96 on Road 192, about five miles west of Terra Bella. Construct a graded roadbed and surface with plant-mixed surfacing on imported base, 5.9 miles. Contract awarded to Stewart & Nuss, Inc., Fresno, $172,107.

Los Angeles County—At the intersections of Foothill Freeway Canada Avenue with Montana Street and of Canada Avenue with Lincoln Avenue. Install complete in place, traffic signal systems and highway lighting. Contract awarded to Electric and Machinery Service, Inc., South Gate, $19,938.

Los Angeles County—SR 2—Between Glendale Avenue and Towne Street. Widen the existing roadbed and place plant mixed surfacing on cement treated base and over portions of the existing pavement and install traffic signal and lighting systems, 0.8 mile. Contract awarded to Griffith Co., Los Angeles, $193,734.40.

Los Angeles County—Between 92d Street and Gage Avenue, on Harbor Freeway. Grade, place concrete pavement on cement treated subgrade, and place plant-mixed surfacing on cement treated base and untreated base, and construct 20 major structures, completion of which provides an eight lane divided freeway together with ramps and frontage roads at 88th Place Undercrossing, 87th Place Pedestrian Undercrossing, Rout 165 174 Separation, Manchester Avenue East Pedestrian Undercrossing, Manchester Avenue West Pedestrian Undercrossing, 84th Street Pedestrian Undercrossing, 83d Street Undercrossing, 81st Street Pedestrian Undercrossing, 79th Street Undercrossing, 78th Street Pedestrian Undercrossing, 76th Street Undercrossing, 74th Street Undercrossing, Florence Avenue Undercrossing, 69th Street Pedestrian Undercrossing, 67th Street Undercrossing, 65th Street Pedestrian Undercrossing, and four concrete retaining walls, 1.8 miles. Contract awarded to Guy F. Atkinson Co., Long Beach, $4,087,411.50.

Los Angeles County—In the vicinity of Clark Avenue, on Lakewood Boulevard. Widen the existing traveled way by grading, placing imported subbase material, place plant-mixed surfacing on untreated base, and construct concrete curbs, completion of which provides a left-turn median lane, 0.3 mile. Contract awarded to G. G. Fisher Paving Co., South Gate, $15,775.

Los Angeles County—At the intersection of Norwalk Boulevard with Florence Avenue, near Santa Fe Springs. Install a full traffic actuated signal system and highway lighting system. Contract awarded to Electric & Machinery Serv., Inc., South Gate, $7,941.

Ventura County—SR 126—About one mile east of the City of Ventura. Construct drainage facilities and a detour. Contract awarded to Charles M. Major & Kings Plumbing, Ojai, $11,842.

Riverside County—SR 79—Between SR 71 and 3.5 miles north of Sage (portions). Grade and surface with road-mixed surfacing, 13.6 miles. Contract awarded to A. S. Hubbs, Colton, $65,323.

Sacramento County—SR 24—Between Isleton and Paintersville Bridge. Construct untreated base borders and apply penetration treatment, 4.5 miles. Contract awarded to Rice Brothers, Inc., Lodi, $16,-493.

San Joaquin County—FAS 907—3.5 miles north of Tracy, at Old River. Construct a graded roadbed, place plant mixed surfacing on untreated base and construct a reinforced concrete girder bridge, 0.5 miles. Contract awarded to Lord & Bishop, Inc., Sacramento, $124,535.50.

San Joaquin, Tuolumne, Mariposa, Calaveras, Stanislaus, and Amador Counties—At various locations, apply seal coat to the existing surfacing, 33.5 miles. Contract awarded to Delta Const. Co., Rio Vista, $41,412.

Solano County—SR 12—Between Fairfield and Travis Air Force Base. Construct a graded roadbed and surface with plant mixed surfacing on untreated base and existing pavement and widen the existing bridge, 4.4 miles. Contract awarded to Parish Bros. & Harms Bros., Sacramento, $303,768.70.

Stanislaus County—SR 132—Across Tuolumne River at Bassos Ferry. Repair the existing reinforced concrete bridge. Contract awarded to H. Sykes, Patterson, $2,905.

San Diego County—US 80—At Jackson Boulevard Undercrossing. Widen a portion of the existing roadway, grade and surface with plant mixed surfacing on untreated base, completion of which provides a four lane detour roadway, and construct a reinforced concrete bridge, 0.4 mile. Contract awarded to Griffith Co., Los Angeles, $141,045.75.

AUGUST, 1955

Mendocino County—US 299—Across Powers Creek, near the community of Blue Lake. Widen one approach to bridge, place untreated base on the widened section, place plant mixed surfacing on both approaches and modify the connection of one road approach. Contract awarded to J. J. Tracey, Eureka, $9,585.

Mendocino County—FAS 982—Between 5.3 miles west of Willits and Willits. Construct a graded roadbed, connections and approaches and install drainage facilities, 5.3 miles. Contract awarded to W. H. Darrough & Sons, Yuba City, $209,457.50.

Siskiyou County—Sign Route 96—Across Irving Creek, about 10 miles north of Somes Bar. Reconstruct the existing bridge with a new timber superstructure and reinforced concrete deck, and regrade approaches at the bridge ends. Contract awarded to Osborne Const. Co., Crescent City, $22,719.

Lassen County—On Antelope Peak, about 7.5 miles northeast of Susanville. Construct a steel building. Contract awarded to Thomas W. Lisota, Redding, $6,997.

Modoc County—US 299—Between Adin and Rush Creek, and between one mile east of Canby and Chambers Ranch. Apply medium seal coat, 11.3 miles. Contract awarded to H. B. Folsom, Westwood, $21,083.

Modoc and Siskiyou Counties—Sign Route 139—Between 2.0 miles north of Stronghold and Oregon State line. Apply fine seal coat, 7.2 miles. Contract awarded to Howard B. Folsom, Westwood, $14,555.

Plumas County—Sign Route 89—At Greenville. Reconstruct and widen the existing roadbed by grading, placing road-mixed surfacing on imported subbase and on cement treated base and applying seal coat. 0.5 miles. Contract awarded to Pyramid Const. Co., Reno, Nev., $37,850.

Shasta and Tehama Counties—US 99, Sign Route 36—At various locations. Apply medium fine and medium seal coats, 33.4 miles. Contract awarded to Howard B. Folsom, Westwood, $53,460.

Siskiyou County,—US 99 and US 97—At three locations. Apply medium seal coat to the existing surfacing, 22.6 miles. Contract awarded to Morgan Const. Co., Redding, $48,915.

Siskiyou County — FAS 1089 — Across Scott River, about two miles east of Etna. Construct a reinforced concrete bridge. Contract awarded to R. M. Skamnes-Skamnes-Bird-Wiggs Co., Inc. Sacramento, $61,225.

Trinity County—FAS 1089—Across Rush Creek, at Costa Ranch, about eight miles north of Weaverville. Construct a steel bridge across Rush Creek. Contract awarded to Barton Const. Co., Oakland, $30,988.80.

Butte County—Sign Route 32—Across Pine Creek Lagoon, about seven miles northwest of Chico. Repair the existing reinforced concrete bridge. Contract awarded to John R. Stephens, Manteca, $3,801.

Butte County—FAS 1169—Between State Highway Route 87 and Oroville-Quincy Highway, in and near Oroville. Place plant-mixed surfacing over the existing base, construct a graded roadbed, place imported subbase material, untreated base and plant-mixed surfacing and apply a penetration treatment and seal coat to shoulders, 1.9 miles. Contract awarded to Baun Const. Co., Inc., Fresno, $83,563.50.

El Dorado, Nevada, Yuba, Sierra and Sacramento Counties—At various locations. Apply fine seal coat to the existing surfacing, 28.0 miles. Contract awarded to A. Teichert & Son, Inc., Sacramento, $47,051.50.

Nevada County—FAS 1203—Between State Highway Route 17, near Town Talk and State Highway Route 25, on Brunswick Road. Construct a graded roadbed and drainage facilities, 3.3 miles. Contract awarded to H. Earl Parker, Inc., Marysville, $115,048.30.

Placer County—US 40 and State Route 91—At the junction of Routes 17 and 91 near Newcastle Grade. Place plant-mixed surfacing on untreated base and install highway lighting, completion of which provides a channelized intersection, 0.2 miles. Contract awarded to Granite Const. Co., Watsonville, $35,296.

Sacramento County—US 50—On the "I" Street Bridge at the intersection of Jibboom Street and "I" Street Ramps. Install signal and illuminated sign systems. Contract awarded to Sacramento Electric Works, Sacramento, $1,330.

Sacramento County—FAS 932—Approaches to American River Bridge, at Fair Oaks. Construct a graded roadbed, place imported subbase material, untreated base and plant-mixed surfacing, install traffic bars and highway lighting systems, 0.8 mile. Contract awarded to Brighton Sand and Gravel Co., Perkins, $132,307.20.

Yolo County—Sign Route 16—Across Yolo Bypass. Construct a graded roadbed and pave with portland cement concrete on cement treated subgrade, 1.5 miles. Contract awarded to A. Teichert & Son, Inc., Sacramento, $123,539.50.

Yuba County—Sign Route 20—About 4.3 miles east of Marysville, at Woodruff Lane. Construct a graded roadbed and surface with plant-mixed surfacing on untreated base, 0.3 mile. Contract awarded to Baldwin Contracting Co., Inc., Marysville, $28,795.50.

Alameda County—US 50—In the vicinity of the San Francisco-Oakland Bay Bridge Toll Plaza. Construct or reconstruct portions of the North Toll Plaza and bridge approach roadways and reconstruct the westbound leg of the Port of Oakland Overcrossing and construct the Toll Plaza Outfall Sewer. Contract awarded to Chas. L. Harney, Inc., San Francisco, $1,744,213.50.

Alameda County—State Route 226—Between 0.3 mile and 0.7 mile south of Bay Farm Island Bridge. Place plant-mixed surfacing on imported subbase material on existing surfacing and cement treat the top portion of the imported subbase material, apply seal coat and screenings, 0.3 mile. Contract awarded to Independent Const. Co., Oakland, $29,697.25.

Alameda County—FAS 1025—Between Decoto Road and Thornton Avenue, on Lincoln Road and Dairy Avenue. Construct a graded roadbed and surface with plant-mixed surfacing on untreated base, 2.0 miles. Contract awarded to Clements Const. Co. & Ronald D. Coats, Centerville, $178,491.95.

Contra Costa County—At the intersection of Potrero Avenue with Hoffman Boulevard. Install drainage facilities. Contract awarded to O. C. Jones & Sons, Berkeley, $17,465.80.

Marin County—State Route 52—At Trestle Glen Drive, on Tiburon Boulevard. Shape the existing roadway shoulder on the left, surface the intersection with plant-mixed surfacing and install metal plate guard railing. Contract awarded to Brown-Ely Co. Contractors, Corte Madera, $8,-154.75.

Marin, Sonoma, Napa, Alameda, Contra Costa, San Mateo, Santa Clara, and Santa Cruz Counties—At various locations. Apply fine seal coat, 40.7 miles. Contract awarded to Granite Const. Co., Watsonville, $62,437.50.

Napa County—At the Napa Wye about five miles south of Napa, at the intersection of Route 8 with Route 74. Install complete in place highway lighting system and three-way flashing beacon. Contract awarded to Ed. Pierce Electric Co., Inc., Vallejo, $3,696.

Napa County—State Route 102—At Soda Creek about 14 miles east of Rutherford. Extend the existing bridge with field assembled plate pipe arch culvert, and widen and surface the existing roadway. Contract awarded to Slinsen Const. Co., Napa, $4,309.

Santa Cruz County—Sign Route 1—Between Sign Route 17 and Mission Street. Construct graded roadbeds and surface with plant-mixed surfacing on untreated base and construct three reinforced concrete bridges and one pedestrian overcrossing at: San Lorenzo River Bridge; Grant Undercrossing; Ocean Street Undercrossing; and High Street Pedestrian Overcrossing, completion of which provides a four-lane divided highway together with frontage roads, ramps and connections, 1.6 miles. Contract awarded to Granite Const. Co., Watsonville, $962,632.

San Francisco—At the intersections of Harrison Street with Seventh Street and Bryant Street with 10th Street. Install two neon sign systems. Contract awarded to Cascade Products, San Francisco, $2,247.

San Mateo County—State Route 107—Between Sign Route 5 and Portola Road (portions). Construct widened roadbed areas, place untreated base material and surface with plant-mixed surfacing, 0.3 mile. Contract awarded to The Fay Improvement Co., San Francisco, $19,780.

San Mateo and Alameda Counties—State Route 107—Between Palo Alto and Newark, across San Francisco Bay. Repair the Dumbarton Bridge. Contract awarded to Payne Const. Co., Oakland, $110,760.

Sonoma County—Sign Route 12—At Pocket Canyon about 1.5 miles west of Forestville. Widen the existing channel, place sacked concrete riprap, extend an existing corrugated metal pipe culvert, 0.1 mile. Contract awarded to Don Dowd Co., Sebastopol, $2,330.

Monterey County—State Route 117—Between Camino El Estero and Del Monte Junction. Construct a graded roadbed together with frontage roads, road connections, crossovers and intersecting roads, surface with plant-mixed surfacing on untreated base and apply seal coats, install traffic signal systems and highway lighting, completion of which provides a four-lane divided highway, 1.2 miles. Contract awarded to Granite Const. Co., Watsonville, $447,722.48.

Santa Barbara, San Luis Obispo, and Monterey Counties—At various locations. Apply fine seal coat, 54.6 miles. Contract awarded to Valley Paving & Const. Co., Inc., Pismo Beach, $76,613.10.

San Luis Obispo County—US 101—At French Road Intersection, near the City of San Luis Obispo. Grade, place imported borrow, imported subbase material and untreated base and surface with plant-mixed surfacing, install highway lighting system, completion of which provides channelization, three speed change lanes and widened road way, 0.2 mile. Contract awarded to A. J. Diane Const. Co., Santa Maria, $23,587.50.

Fresno, Kings, Tulare, and Kern Counties—At various locations. Apply seal coat, 32.9 miles. Contract awarded to Rand Const. Co., Bakersfield, $33,798.

Kern County—US 99—Between Taylor Avenue and Elmo Highway. Prepare roadside areas, install watering system and plant trees, 1.5 miles. Contract awarded to Oliver's Flower Shop & Nursery, Fresno, $14,938.80.

Kern County—Sign Route 178—Between 2 miles west of Bena and 0.8 mile east of Arvin Road. Install reflectorized guide posts and reflectorize the existing guide posts. Contract awarded to Wulfert Company, Inc., San Leandro, $3,392.95.

Kings County—Sign Route 41—Across South Fork of Kings River about 2.6 miles south of Fresno County line. Grade bridge approaches and surface with plant-mixed surfacing on untreated base, grade and surface a detour with road-mixed surfacing and construct a reinforced concrete bridge, 0.25 mile. Contract awarded to Thomas Const. Co., Fresno, $66,665.

Mariposa County—FAS 811—Between 3.5 miles and 6.5 miles east of Firebaugh and between 9 miles southwest and 6 miles west of Madera, on Madera-Firebaugh Road. Grade roadbeds and place plant-mixed surfacing on cement treated base and install drainage facilities, 5.1 miles. Contract awarded to M. J. Ruddy & Son, Modesto, $138,047.

Tulare County—FAS 579—At Elbow Creek and Cottonwood Creek, about seven miles south of Dinuba. Widen two concrete bridges. Contract awarded to Kaweah Const. Co., Visalia, $23,626.58.

Los Angeles County—US 101—Between Grand Avenue and Lyon Street, on the Hollywood and Santa Ana Freeways. Alter an existing freeway on-ramp, grade and pave a collector road, join an existing on and off-ramp, install highway lighting and illuminated sign systems, and prepare and plant roadside areas, 0.8 mile. Contract awarded to J. E. Haddock, Ltd., Pasadena, $149,237.30.

Los Angeles County—US 99—Between Wolfskill Street and Workman Street, on San Fernando Road and on Truman Street. Install complete in place pre-timed traffic signal system and highway lighting and modify existing traffic signal systems. Contract awarded to C. D. Draucker, Inc., Los Angeles, $14,998.

Los Angeles County—At various locations. Apply seal coat to existing surfacing, 26.5 miles. Contract awarded to Contractors Specialty Const. Co., Inc., Laguna Beach, $30,580.

Los Angeles County—US 6—Between 1.7 miles north of Lancaster and Kern County line, at four locations. Replace four existing corrugated metal pipes. Contract awarded to C. E. Wooster, Bakersfield, $3,472.82.

Los Angeles County—On the Golden State Freeway, at Los Feliz Boulevard. Construct a graded roadbed, place asphalt concrete on selected material and untreated base and construct two bridges, completion of which provides new city street together with two reinforced concrete bridges at Los Feliz Boulevard Overcrossing and at Los Feliz Boulevard On-Ramp Overcrossing, 0.4 mile. Contract awarded to Vinnell Co., Inc., and Vinnell Const., Alhambra, $683,568.

Los Angeles County—Between 0.3 mile south of Imperial Highway and 0.3 mile south of Southern Avenue, on the Long Beach Freeway. Construct a graded roadbed and surface with plant-mixed surfacing on cement treated base and untreated base and construct a reinforced concrete bridge, at the Imperial Highway Overcrossing, 1.1 miles. Contract awarded to Oberg Brothers Const., Inglewood, $797,763.

Los Angeles County—At Crenshaw Boulevard and at Casimir Avenue, on 174th Street and at Crenshaw Boulevard on Pacific Coast Highway. Install or modify traffic signal systems, highway lighting and channelization. Contract awarded to Ed Seymour, Long Beach, $20,995.

Orange County—Sign Route 18—At the intersection of Santa Ana Canyon Road with Orange-Olive Road, about one mile east of Olive. Construct a deceleration lane adjacent to the southbound roadway with plant mixed surfacing on untreated base. Contract awarded to Cox Brothers Const. Co., Stanton, $4,078.

Ventura, Los Angeles, and Orange Counties—At various locations. Apply seal coats to the existing surfacing, 24.1 miles. Contract awarded to Baker & Pollock, Ventura, $57,800.

Ventura County—Alt. 101—At the intersection of Oxnard Boulevard with Gonzales Road, near the City of Oxnard; and at the intersections of Main Street with Eighth Street and 10th Street in Santa Paula. Install traffic signal systems and construct channelization. Contract awarded to Westates Electrical Const. Co., Los Angeles, $15,826.

Los Angeles, San Bernardino and Riverside Counties—At various locations. Apply seal coats, 48.5 miles. Contract awarded to George E. Hickey, Van Nuys, $81,702.

San Bernardino and Riverside Counties—At various locations. Place seal coat on traveled way, 66.0 miles. Contract awarded to Einer Bros. Inc., Escondido, $69,332.40.

San Bernardino and Riverside Counties—US 70-99—Between Live Oak Canyon and Beaumont. Place two applications of medium seal coat on the traveled way, 9.2 miles. Contract awarded to Contractors Specialty Const. Co., Inc., Laguna Beach, $39,075.

San Bernardino County—At the intersection of US 70-99 with Euclid Avenue, in Upland and Ontario. Prepare and plant roadside areas with lawn and ground cover, 300 feet. Contract awarded to Armstrong Nurseries, Inc., Ontario, $3,491.23.

San Bernardino County—Sign Routes 138 and 30—Between 6.1 miles northwest of Cahon and Cahon and between Haven Avenue and Willow Avenue. Surface shoulders with road-mixed surfacing over the existing and imported material, 15.8 miles. Contract awarded to George Herz & Co., San Bernardino, $46,955.20.

San Bernardino County—Sign Route 2—Across Big Pines Creek, about 38 miles east of Los Angeles County line. Redeck the existing bridge and resurface the approaches. Contract awarded to E. S. & N. S. Johnson, Fullerton, $5,990.

San Bernardino County—Sign Route 30—Between 0.25 mile west of Riverside Avenue and Western Avenue in San Bernardino. Grade, place surfacing and base; construct channelization, connections and approaches and install traffic control facilities, a portion of which, when completed provides four-lane divided highway, 3.2 miles. Contract awarded to A. S. Hubbs, Colton, $244,315.

San Bernardino County—Sign Routes 18-30—At Running Springs. Construct a graded roadbed and place plant-mixed surfacing and selected material, 0.2 mile. Contract awarded to Matich Bros., Colton, $18,554.

Inyo County—FAS 1183—Between 8.5 miles west of Independence and Forest Boundary, on Onion Valley Road. Grade and surface with road-mixed surfacing on imported base material, completion of which provides a two-lane roadway, part of which is on new alignment, 4.2 miles. Contract awarded to I. L. Croft & Son, Inc., Saugus, $195,740.48.

Kern, Inyo, and Mono Counties—At various locations. Apply seal coats, 56.4 miles. Contract awarded to Granite Const. Co., Watsonville, $69,210.

Merced County—Sign Route 140—At Eastside Canal, 12.8 miles east of Gustine. Grade approaches, place imported subbase material, untreated base and plant-mixed surfacing, and construct a reinforced concrete slab bridge, 0.6 mile. Contract awarded to Chas. L. Harney Inc., San Francisco, $68,713.60.

San Joaquin County—Sign Route 12—Between Terminus and 3.7 miles easterly. Cement treat the existing base, surface with plant-mixed surfacing on the cement treated base, apply seal coat and place imported borrow on the shoulder areas, 3.7 miles. Contract awarded to Rice Brothers Inc., Lodi, $69,432.50.

Solano County—US 40—Between Admiral Callahan Lane and extension of Route 208. Grade, place plant-mixed surfacing on untreated base, completion of which provides a new frontage road, 1.2 miles. Contract awarded to Parish Brothers Inc., Benicia, $47,891.50.

Solano County—FAS 1108—Between Vacaville and Elmira. Construct a graded roadbed, place imported subbase material, untreated base, surface with plant-mixed surfacing and double seal coat and widen the existing bridge, 1.9 miles. Contract awarded to Fredrickson Bros., Emeryville, $91,757.

Stanislaus County—Sign Route 120—In the City of Riverbank. Surface with plant-mixed surfacing and pave between curbs and existing pavement with plant-mixed surfacing on untreated base, 0.6 mile. Contract awarded to Standard Materials, Inc., Modesto, $24,245.

Stanislaus, Solano, Tuolumne, Mariposa, Amador, Calaveras, San Joaquin and Merced Counties—At various locations. Apply medium fine seal coat, 36.1 miles. Contract awarded to George Reed, Modesto, $49,962.65.

Tuolumne County—FAS 919—Between State Highway Route 13 and Stanislaus County line, on Keystone-La Grange Road. Place plant-mixed surfacing on existing base, 12.6 miles. Contract awarded to M. J. Ruddy & Son, Modesto, $75,675.

San Diego County—US 395—Between A Street and Date Street. Grade and widen traffic lanes, surface with plant-mixed surfacing on concrete base and over existing pavement and install highway lighting and signal systems, 0.3 mile. Contract awarded to Griffith Co., Los Angeles, $57,897.70.

San Diego County—Sign Route 76—About 1.8 miles and 4.3 miles east of Rincon (at two locations). Install metal plate guard railing, 538 linear feet. Contract awarded to Roy C. Ek, San Diego, $1,689.32.

MANY THANKS, JIM

NATIONAL AUTOMOBILE CLUB
San Francisco 4, California

August 24, 1955

MR. KENNETH C. ADAMS, Editor

DEAR MR. ADAMS: Congratulations to you and your staff for putting out a most interesting and informative magazine. Text and pictures all serve admirably to keep us abreast of the very latest developments in the California Highway System and many of our department heads read each issue eagerly when it comes in the mail.

Again, congratulations and many thanks!

Cordially yours,

NATIONAL MOTORIST
JIM DONALDSON, Editor

In Memoriam

LEO J. McCARTHY, SR.

A recently retired member of the District VII Right of Way Department, Division of Highways, Leo J. McCarthy, Sr., died at St. Vincent's Hospital, September 9th, after a prolonged illness. Rosary for Mr. McCarthy was recited the following Sunday evening at the Cathedral Chapel Church in Los Angeles and Requiem Mass was celebrated the next day.

The last three years of Leo's long service with the Division of Highways was as property disposal agent and auctioneer for the Excess Land Section of District VII in Los Angeles.

Leo was born in San Francisco April 14, 1885. He was graduated from St. Mary's College in Oakland in 1906 and prior to the beginning of his career with the State of California was Superintendent of Streets of the City of Oakland; Secretary and Managing Director of the National Catholic Welfare Council; and Field Secretary to Most Rev. Edward J. Hanna, D. D. Archbishop of San Francisco.

In addition to his widow, Mrs. Loretta Marie McCarthy, he leaves four sons, Leo J., Jr., Paul R., Justin W. and Peter York; a daughter, Mrs. Patricia Marie McGarry, and 10 grandchildren.

Leo will be greatly missed by his many friends and associates both within and without the Division of Highways and they extend their deep sympathy to his family.

VALUE OF HIGHWAY CONTRACTS

The value of 371 highway contracts under way on September 1, 1955, was $234,917,800, which compares with the previous all-time high of $238,031,500 on June 30, 1955, when 381 contracts were under way, according to State Highway Engineer George T. McCoy.

Up to September 1, 1955, construction included 1,662 miles of freeways, expressways and multilane divided highways on the State Highway System completed or put under way.

GOODWIN J. KNIGHT
Governor of California

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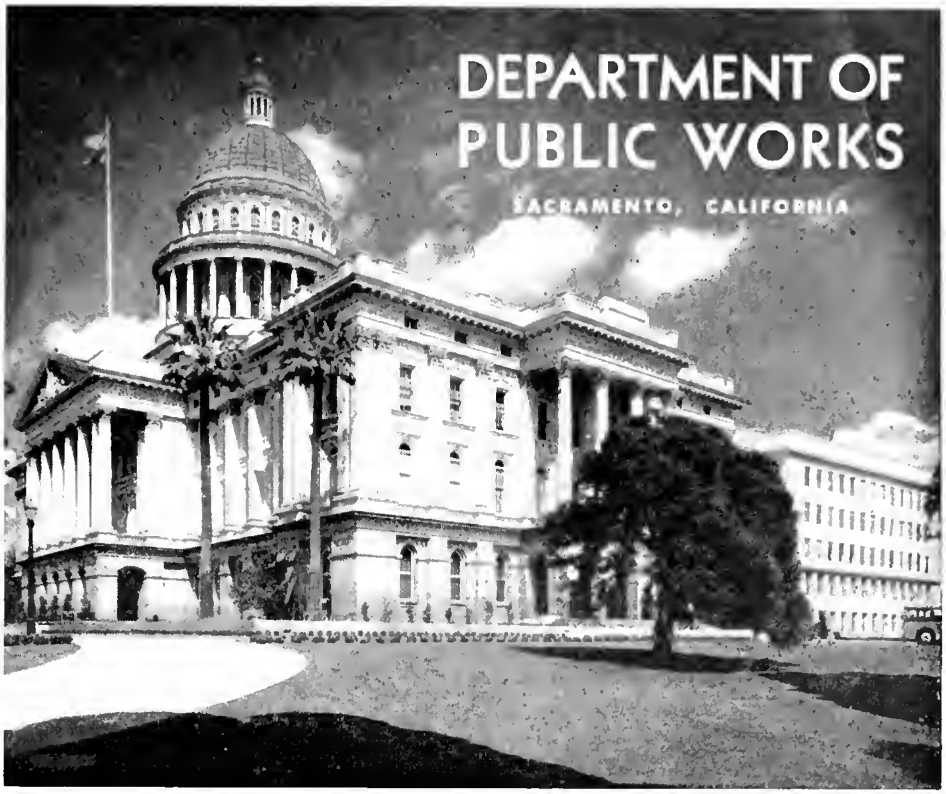

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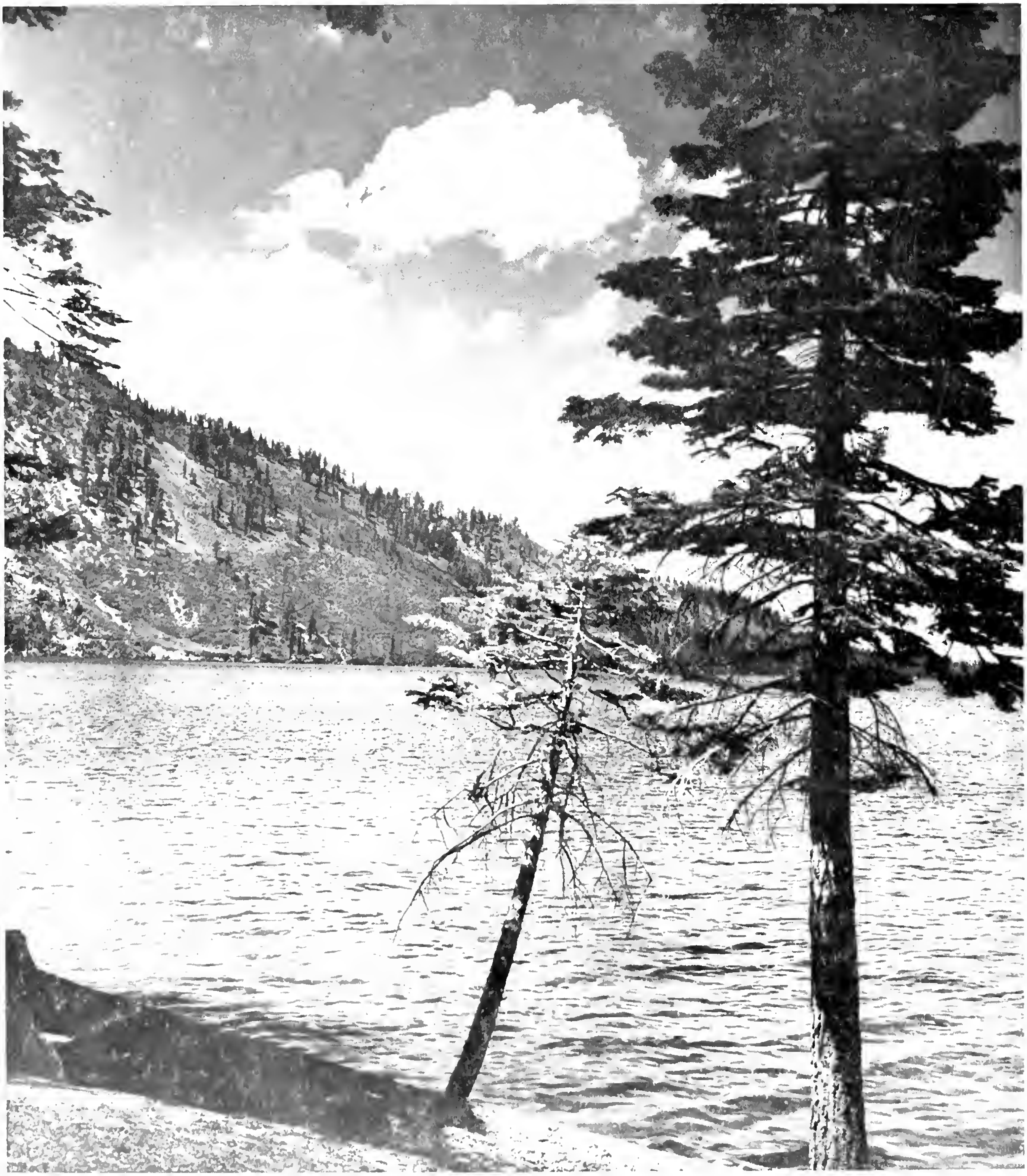
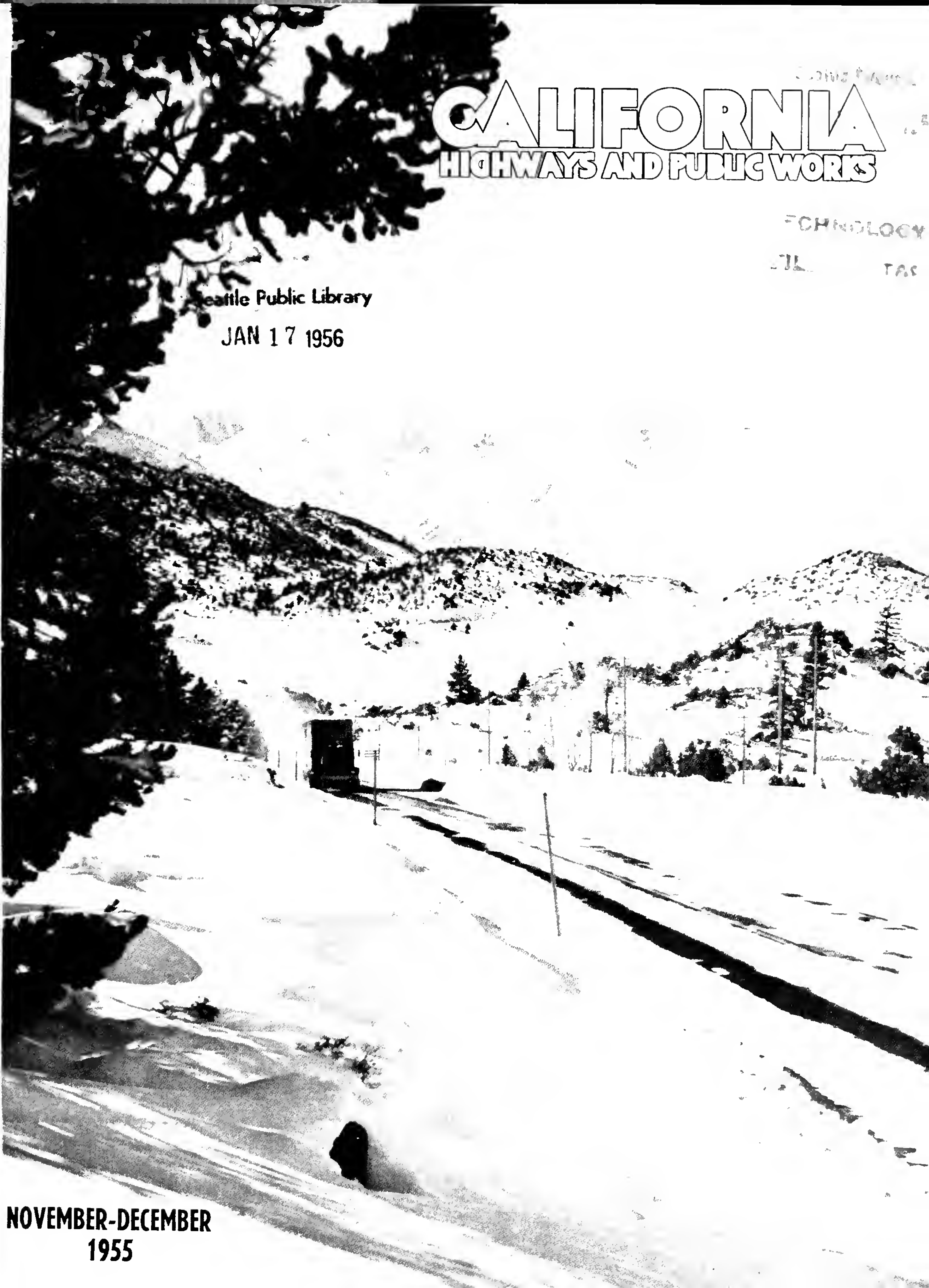


Fallen Leaf Lake near Lake Tahoe as seen from State Route 94. Photo by Robert J. Rose, Photographic Section, Department of Public Works.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS



NOVEMBER-DECEMBER
1955

California Highways and Public Works

Official Journal of the Division of Highways, Department of Public Works, State of California

KENNETH C. ADAMS, *Editor*
HELEN HALSTED, *Assistant Editor*
MERRITT R. NICKERSON, *Chief Photographer*

Vol. 34 November-December Nos. 11-12

Public Works Building Twelfth and N Streets Sacramento

CONTENTS

FROM THE CHIEF JUSTICE

SUPREME COURT OF THE UNITED STATES
Washington 13, D. C.
CHAMBERS OF
THE CHIEF JUSTICE

November 14, 1955

MR. K. C. ADAMS, *Editor*
California Highways and Public Works

Dear Ken: Enclosed you will find the card requesting the *California Highways and Public Works.* I would feel lost without it. For me, it is as exhilarating as a western thriller. I read and reread every issue because it reflects more than any other publication the growth, development and progress of California.

With best wishes to you and all of your associates in the Department of Public Works, I am

Sincerely,
EARL WARREN

Published in the interest of highway development in California. Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

Address communications to
CALIFORNIA HIGHWAYS AND PUBLIC WORKS
P. O. Box 1499
Sacramento, California

Freeways In District XI

By J. DEKEMA
District Engineer

San Diego Meets Challenge For Modern Highways

The phenomenal growth of the San Diego area continues to demand the modern highway transportation that is the foundation of today's economy. As an illustration of the growth of San Diego County, suffice it to state that the population has increased in the past 50 years at a rate almost 2½ times as great as the growth rate for the State of California as a whole.

Fortunately, the citizens of San Diego have been acutely highway conscious since the advent of the automobile. The county is blessed with many fine highways built years ago as a result of public donations and local bond issues. Austin B. Fletcher organized the county highway system in such a fine manner that he was offered the position of State Highway Engineer to do a similar job for the State after passage of the first state highway bond issue.

Advance Planning

Far-sighted advance planning has continued, and as early as 1931 the City of San Diego adopted a "Major Street Plan" that incorporates many of today's freeway projects.

The California Division of Highways, the County of San Diego, and the cities of the metropolitan area are cooperating in the development of an integrated system of freeways, major highways and city streets. The City of San Diego has established a technical coordinating committee, including a committee on transportation research, which is establishing a long range system for the ultimate development of the entire road system in this area. This committee is integrating the city and county major street and highway plans with the State's freeway system. The ultimate aim of this committee is the adopted location of all future freeways and major highways and the establishment of final grades and the advance geometric design of all interchange facilities.

Local Agencies Cooperate

The Division of Highways in cooperation with local agencies is establishing the ultimate location of all future state freeways and the location of all future interchanges and ramp connections so that local planning departments can establish outlets and connections for their systems.

Federal Aid Secondary job in Alvarado Canyon in La Mesa, Jackson Street intersection. Fletcher Hills in background. Limited access design.

Vista Way separation at junction of US 101 and Sign Route 78 between Oceanside and Carlsbad, showing diamond type ramps

The goal in mind has been a system that will make it easy for motorists to enter the downtown area, or to avoid it if they wish. The San Diego traffic survey in 1952-53 showed 24 percent of all trips originate or end in the downtown business area. The basic freeway system consists essentially of the state highways in the area. The California Highway Commission has adopted a freeway routing for each of the state highways traversing the City of San Diego, US 80, US 101, US 395, and State Sign Route 94. In the remainder of the county all of US 395, most of US 101 and segments of US 80 and State Sign Routes 67 and 78 have been adopted as freeways by the commission.

The accompanying map indicates the status of freeway progress in San Diego County.

Cabrillo Freeway Expansion

Much of the work contemplated is the further improvement of existing freeways and expressways. The well-known Cabrillo Freeway, carrying US 395 through the heart of beautiful Balboa Park, requires expansion from four lanes to six and the modernization of several interchanges. On the same road, north of Mission Valley, through the Linda Vista area, Griffith Company holds a $668,472 contract to convert 1.95 miles of the present expressway to a full freeway. Interchanges are to be built at Genesee Avenue and Aero Drive and a frontage road is to be constructed between them. At-grade intersections at Fulton Street and Homewood Avenue are to be closed. The resident engineer, James A. Jesperson, expects completion of the contract about July 31, 1956.

Because of the heavy traffic generated by the Naval Air Station at Miramar, the elimination of all grade intersections on the present expressway is being planned. Increasing commuter and commercial traffic between San Diego and Escondido will also require expanding the present facility from two lanes to four north of Miramar. In District VIII further improvement of US 395 through the Cities of Riverside and San Bernardino, combined with eventual completion on modern standards of State Sign Route 71 from the junction with US 395 between Temecula and Murrietta through Elsinore and Corona to Pomona will ultimately generate sufficient traffic to require conversion of all of US 395 in San Diego County to freeway standards. Fortunately, much of the right of way originally purchased is of sufficient width to permit expansion, and most of the access rights have been bought.

On US 101

The other major north-south highway facility serving San Diego County is US 101. Except for a short section from Del Mar to Leucadia, the entire route has been declared a freeway by the California Highway Commission. Studies on this short section have progressed sufficiently so that meetings are being conducted by the district engineer to acquaint the public with the facts that have been developed and to obtain additonal information that will enable the State Highway Engineer to arrive at a tentative conclusion for consideration by the commission.

Several sections of US 101 have been completed to freeway standards. At the south end of the county the Montgomery Freeway, with the exception of three at-grade intersections, has been completed from the Mexican border to 13th Street in National City, a distance of 13 miles. From this point north to the completed portion of the San Diego Freeway through Carlsbad and Oceanside the existing highway consists of short stretches of freeway together with sections of highly improved multilane divided highway. Pacific Highway (US 101) past the San Diego Civic Center is now carrying an A. D. T. of 40,000 vehicles, and at Oceanside it is about 25,000.

During 1952 and 1953 a cooperative origin and destination study was conducted by the Federal Government, the State of California, and the City of San Diego. Through personal interviews with motorists, post card surveys, traffic counts, and projection of traffic patterns, were determined the needs, desires and traffic requirements throughout the San Diego metropolitan area.

Lack of Crosstown Arteries

The lack of crosstown or aroundtown arteries has been a serious handicap in the San Diego area, for the terrain is bisected by many deep canyons. One of the chief difficulties has been that motorists wanting to get to the opposite side of the city from any given point have had to pass through the congested business area. The origin-and-destination traffic study showed that 30,000 cars a day shuttled through the city without stopping. Most of these cars were starting from and stopping at points within the county. This meant wasted gasoline and wasted hours for many motorists.

These studies indicated that to reduce the load on the existing US 101 to a volume that it can comfortably carry, a new freeway location swinging around the downtown area to the north and east is necessary. The total estimated cost, from the end of the Montgomery Freeway in National City to the junction with the existing highway at Washington Street north of the civic center, is 45 million dollars. Plans are now being prepared for this freeway to gradually ascend the hillside southerly of Washington Street, overlooking San Diego Bay, looping into Balboa Park to cross the Cabrillo Freeway at Date Street, and then south to join the Montgomery Freeway.

East-west Freeways

Two major east-west freeways appear on the map of metropolitan San Diego. One of these, US 80 through Mission Valley, was constructed to expressway standards by the City and County of San Diego (FAS) and subsequently taken into the State Highway System as Route 12 to replace the outmoded El Cajon Boulevard. The district is actively engaged in preparing plans to convert the entire road from US 101 to El Cajon to a full freeway, eliminating the hazardous and congestion-creating signals at various intersections.

The first unit is planned for construction in the immediate future. The first contract in this conversion program is construction of an interchange

Sign Route 78 between Oceanside and Vista. Typical intersection. Limited access design.

at Baltimore Drive near La Mesa. Bids for this project were opened on October 14, 1955, V. R. Dennis being low with a price of $410,913. Work should be completed by July 1, 1956, according to resident engineer, A. C. Estep. This project includes a frontage road paralleling the highway from east of Maryland Avenue to the Baltimore Drive overcrossing. This job is about three-fourths of a mile in length and will provide an excellent connection for traffic using the federal aid secondary contract now nearing completion on Alvarado Avenue extension. The latter project is itself an expressway and will feed traffic to and from the nearby Fletcher Hills residential section and from the northerly El Cajon area.

Interchange Projects

The 1956-57 Fiscal Year budget allocates funds for an interchange at Lake Murray Boulevard and conversion of 1.5 miles of the present US 80 at that location to a full freeway. Elimination of signals at Fairmount Avenue, Ward Road and Texas Street will follow as soon as funds can be made available.

One of the pending Mission Valley projects which is unique is the proposed revision of the present interchange at the junction of Routes US 80 and US 395. The existing facility was one of the foremost highway developments in this area at the time it was constructed, being the first of its type in Southern California. It was a noteworthy advance in highway design and proved satisfactory for the traffic volumes that were contemplated at the time it was designed. However, the phenomenal population and traffic growth in the San Diego area could not be rationally predicted. Thus the design capacity of the existing facility has been reached at a much earlier date than could possibly be foreseen. Plans are currently being completed to revise the interchange to accommodate present and anticipated traffic volumes.

The second major east-west freeway in metropolitan San Diego consists of a combination of State Legislative Routes 200 and 198, Sign Routes 94 and 67. The new freeway route was adopted by the Highway Commission in three units: the first, Wabash Boulevard to Campo Road on June 17, 1953; the second, from Campo Road to Highway 80 on October 22, 1953; and the last from 18th Street to Wabash Boulevard on November 17, 1954. Two projects are already under contract, a third advertised, the fourth is in the 1956-57 Fiscal Year budget, and the fifth and final link will be built as soon as the right of way can be cleared and construction funds made available.

This freeway begins at a junction with the new US 101 freeway near 18th and F Streets in downtown San Diego, and joins US 80 at Grossmont Summit in La Mesa, 11.1 miles away.

Bridge Structures

The two contracts under way are held by the Guy F. Atkinson Company and total 4.5 million dollars for 4.5 miles of six-lane freeway that can be ultimately expanded to eight lanes. Clarence E. Walcott is resident engineer on the first contract, with R. L. Hathaway the representative for the Bridge Department. The following four bridges are included:

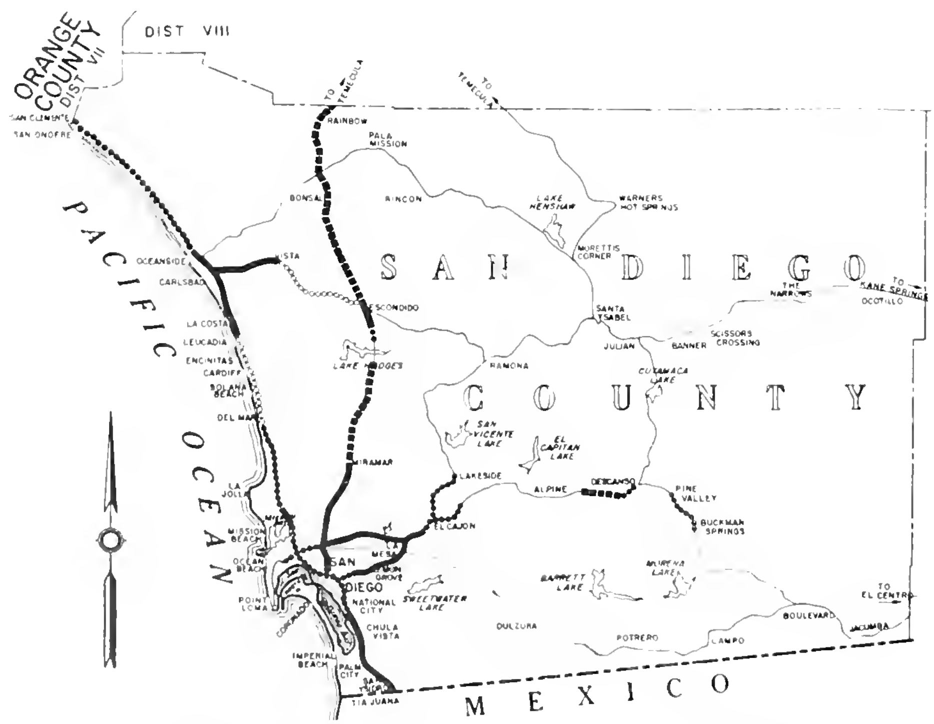
College Avenue Undercrossing. A single span welded steel bridge with composite reinforced concrete deck slab approximately 84 feet long, providing two roadways, one, 61 feet wide and the other, 56 feet wide.

Broadway On-ramp O. C. A single span welded steel bridge with composite reinforced concrete deck slab approximately 114 feet long, providing a roadway width of 22 feet.

Federal Boulevard On-ramp U. C. A single span reinforced concrete box girder bridge about 46 feet long, providing two separated roadways, each 49 feet wide.

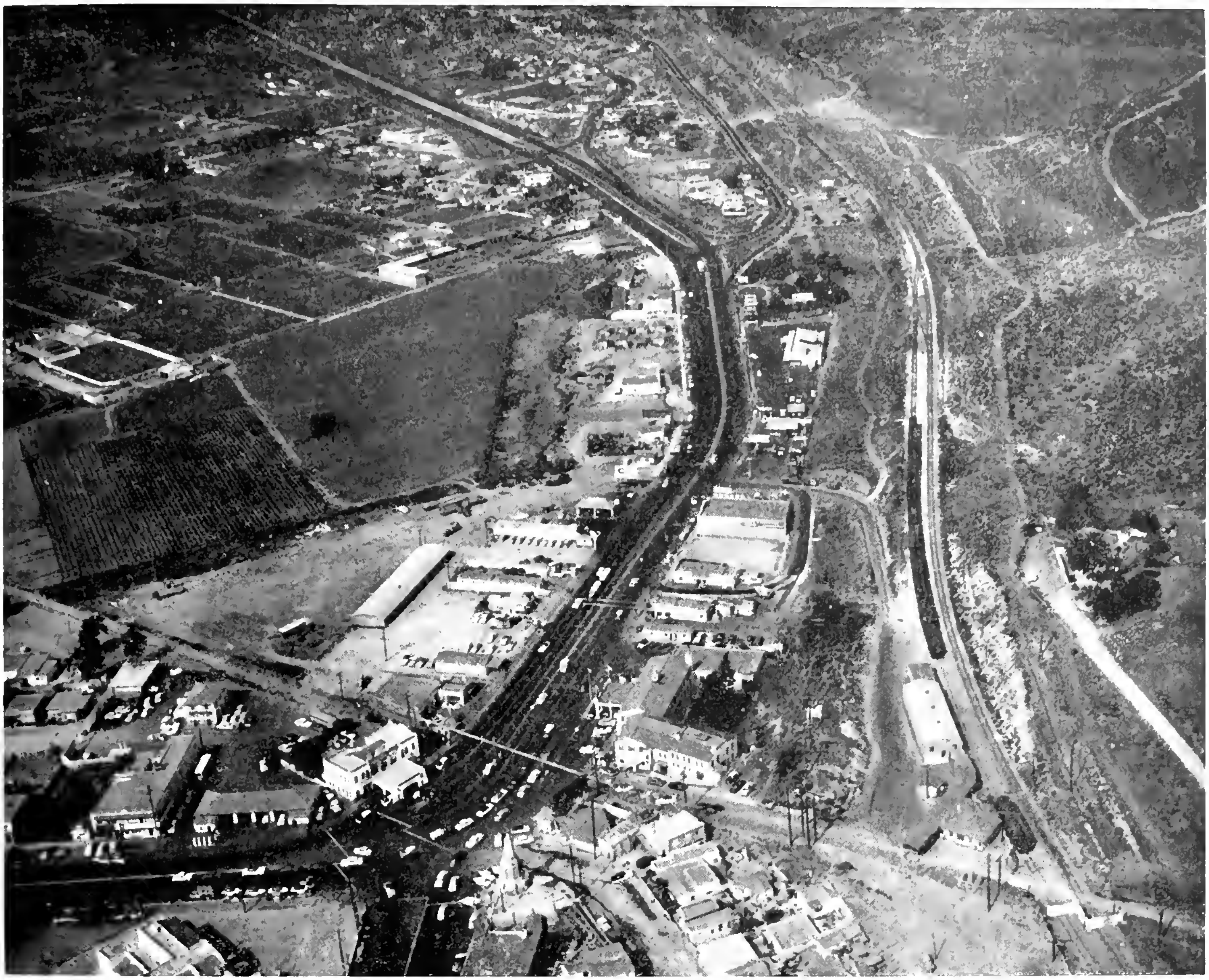
Fifty-sixth Street O. C. A four-span reinforced concrete bridge about 225 feet long, consisting of two 70-foot box girder spans and two flat slab spans; one, 35 feet and the other, 60 feet.

Trepte Corporation is subcontractor on the bridges.



MAP OF
SAN DIEGO COUNTY
SHOWING
FREEWAY PROGRESS ON
STATE HIGHWAYS
AS OF NOV., 1955

LEGEND
FREEWAYS AND EXPRESSWAYS COMPLETED, UNDER CONSTRUCTION OR BUDGETED
EXPRESSWAYS, INITIAL TWO LANES COMPLETED, UNDER CONSTRUCTION, OR BUDGETED
ADOPTED FREEWAY AND EXPRESSWAY LOCATIONS CONSTRUCTION TO BE BUDGETED
FREEWAY ROUTINGS UNDER STUDY



Beginning US 101 and Montgomery Freeway at Mexican border. International Gate in foreground, old US 101 junction in upper right background

Donald C. Smith is resident engineer on the second contract, which includes the following structures:

Massachusetts Avenue U. C. Two separate structures, each consisting of a welded steel girder span and two concrete girder spans. The westbound structure is approximately 156 feet long with a roadway width of 40 feet and the eastbound structure is about 172 feet with a roadway width of 50 feet.

Waite Drive U. C. Two separate structures, each with one reinforced concrete box girder span and two concrete "T" beam spans. The westbound structure is about 166 feet long with a roadway width of 40 feet, and the eastbound structure is about 146 feet long with a 42 feet wide roadway.

Grove Street O. C. The two span reinforced concrete box girder bridge about 216 feet long, providing a roadway width of 28 feet.

Grove Street U. P. A two-span riveted structural steel girder bridge about 247 feet long, providing for a single railroad track.

Route 198/200 Railroad Separation. A single span reinforced concrete "T" beam bridge about 55 feet long and providing two separate roadways, one 49 feet wide and the other providing a minimum of 61 feet. The three pedestrian structures are as follows:

Costa Bella Drive P. O. C. A four-span reinforced concrete girder bridge about 301 feet long and providing an eight-foot walkway.

Quarry Road P. U. C. A reinforced concrete box and "U" section about 264 feet long, providing an eight-foot walkway.

Dexter Drive P. U. C. A reinforced concrete box and "U" section about 298 feet long, providing an eight-foot walkway.

Mr. Hathaway is also Bridge Department Representative on this contract.

The first contract, from Euclid Avenue to College Avenue, a distance of 2.4 miles, is expected to be com-

Sign Route 94, 56th Street separation near east city limits of San Diego, with new subdivision development in area.

pleted by April, 1956. The second unit, from College Avenue to Campo Road should be open to traffic less than a year later.

From Campo Road to the junction with US 80 near the Grossmont Summit is a distance of 1.90 miles, and bids will be opened on December 2, 1955. The four bridges included in this proposed contract are:

Panorama Drive U. C. A three-span welded steel girder bridge about 165 feet long and providing a 28-foot roadway.

Mariposa Street O. C. A two-span welded steel girder bridge about 123 feet long, providing a 28-foot roadway and one five-foot sidewalk.

Lemon Avenue U. C. Two parallel bridges each consisting of two reinforced concrete "T" beam approach spans and one welded steel girder span about 130 feet long. The westbound structure provides a 28-foot roadway and the eastbound provides a 44-foot roadway.

Grossmont Boulevard U. C. Similar to Lemon Avenue U. C. except each roadway is 28 feet wide and the westbound bridge is about 137 feet long and the eastbound about 158 feet long.

The development of the existing highway through the Grossmont Summit involves several interesting and complex problems. This section must merge two large freeways, Route 12, US 80, and Route 198, State Sign Route 67; must provide adequate service to the La Mesa area via East La Mesa Boulevard; must adequately provide for the circulation of local traffic, both to and from the freeway as well as across the freeway, and must make adequate provision for the handling of pedestrian traffic to the Grossmont High School. The easterly section of the Grossmont Summit development will provide a primary connection to the El Cajon Valley area via the existing El Cajon Boulevard, and will provide for a relocated freeway development of US 80 to the north and east.

System of Ramps

These various movements and connections will be adequately provided for with a system of ramps and structures that will safely channelize traffic into the various arteries with no conflicting movements. A structure will be provided to permit direct access to La Mesa Boulevard from US 80; a second structure will separate conflicting movements from both US 80 and State Sign Route 67; an overhead structure will be provided at Fuerte Drive to permit the circulation of local traffic and to provide access to and from both freeways; a separation structure will be provided near Murray Boulevard to permit circulation of local traffic and to provide access to and from the freeway to areas on the east. A pedestrian overhead structure will be provided near Murray Boulevard to accommodate pedestrian traffic between the Grossmont High School and areas south of the freeway. In a future contract a major structure will be provided just east of Grossmont Summit to carry the new freeway over the S. D. and A. E. Railway and to provide a direct connection to the freeway westbound from the El Cajon area (US 80).

Bridge Advertising

At the other end of the freeway the section from Wabash Boulevard to Euclid Avenue is in the 1956-57 Fiscal Year Budget and should be ready for advertising in the near future. The bridges on this proposed contract are:

Home Avenue Off-ramp U. C. A six-span steel girder bridge about 422 feet long, providing a roadway width of 22 feet.

Home Avenue On-ramp Bridge. A four-span reinforced concrete "T" beam bridge about 140 feet long and providing a 22-foot roadway.

Forty-seventh Street O. C. A four-span reinforced concrete bridge about 255 feet long, consisting of two box girder spans and two "T" beam spans, and providing a roadway of 52 feet and two five-foot sidewalks.

Euclid Avenue O. C. A four-span reinforced concrete bridge about 292 feet long, consisting of two box girder spans, one flat slab span, and one "T" beam span and providing two divided roadways, each 26 feet wide.

To summarize, there are 17 bridges and three pedestrian structures included in these four contracts. They include six structural steel bridges of which five have a concrete deck and one is a railroad bridge, eleven reinforced concrete bridges and three bridges which are part structural steel and part reinforced concrete. There is approximately $2,750,000 worth of bridges included in these contracts.

Plans are being completed for the portion between 18th Street and Wabash Boulevard and the entire freeway from downtown San Diego to Grossmont Summit should be open to traffic in a few years. Further extension of State Sign Route 67 to the north through Lakeside is also planned for the future and the freeway route through this area has been adopted.

In the northern part of the county heavy traffic between Oceanside, Vista, and Escondido has necessitated the start of freeway construction in this area. An expressway from Oceanside to Vista was constructed under two contracts, the last of which was completed on June 28, 1955. Cost of the first contract covering 3.48 miles was $608,865 and it was built by the Griffith Company. The second contract, covering 3.41 miles was held by W. F. Maxwell Co. and Hermreck and Easter with a final cost of $602,000. J. A. Jesperson was resident engineer on both projects.

Studies are underway to extend the project 11 miles from Vista to a junction with US 395 at Escondido. This freeway will complete a loop of limited access facilities around San Diego-Oceanside-Escondido-El Cajon that will bring a freeway to the doorstep of 90 percent of the population of San Diego County. The continued growth and economic prosperity of the area are assured by this distribution system now either completed or on the engineer's drawing boards.

CLEANING HIGHWAYS EXPENSIVE

A total of $5,000,000 is expended yearly in Los Angeles, Orange, and Ventura Counties to clean up roadside litter tossed on the highways by careless motorists, according to a State Division of Highways official.

Low Accident Rate On Freeways Can Be Further Reduced

The relatively low accident and fatality rates on freeways can be further reduced if motorists will follow a courteous and sensible safety program of freeway driving "musts," says the California State Automobile Association. The motorists' organization lists the five points of the program as follows:

1. Slow drivers keep to the right. Remember, if you're being repeatedly passed on your right, you're probably in the wrong lane. Carefully move over to the lane farthest to the right.

2. Adjust your speed and following distance to the flow of traffic and weather. One car length for each 10 m.p.h. of speed is advised; in other words, at 40 m.p.h. stay four car lengths behind the car ahead, at 50 m.p.h. stay five car lengths.

3. Decrease your speed and increase your following distance during rain or poor visibility; also use headlamps, not parking lights.

4. Watch the signs and avoid excessive or abrupt lane changing by planning ahead. If you intend to exit at a given point, allow yourself plenty of time to change lanes easily. In all cases, look first, then be sure to signal and change lanes one at a time.

5. If you miss a turn-off, don't slow up or engage in any erratic maneuvers. Continue as you are, for there is only one thing to do in such a case and that is to go on the next exit point. It is always prudent to study beforehand a freeway map of a city in which you have never driven before, but if you do find yourself on a strange freeway without previous study, be extra alert to spot the exit you want.

Speaking before the Los Angeles Chamber of Commerce Los Angeles Beautiful Committee, W. D. Sedgwick, district maintenance engineer for the division, said a large portion of the time of maintenance and landscaping crews is spent in picking up trash on state highways in this district.

"Open Water" Fill

Unique Project Is Nearing Completion

By VINCENT O. SMITH, Senior Highway Engineer

On November 9, 1955, a contract was awarded to Guy F. Atkinson Co. for completion of the grading of one of the most unusual and interesting highway projects ever attempted. This portion of Bayshore Freeway, between the intersection of Third Street and Bayshore Boulevard in San Francisco and South San Francisco, will cross an arm of San Francisco Bay approximately two miles wide, bypassing one of the most congested sections of highway in the Bay area.

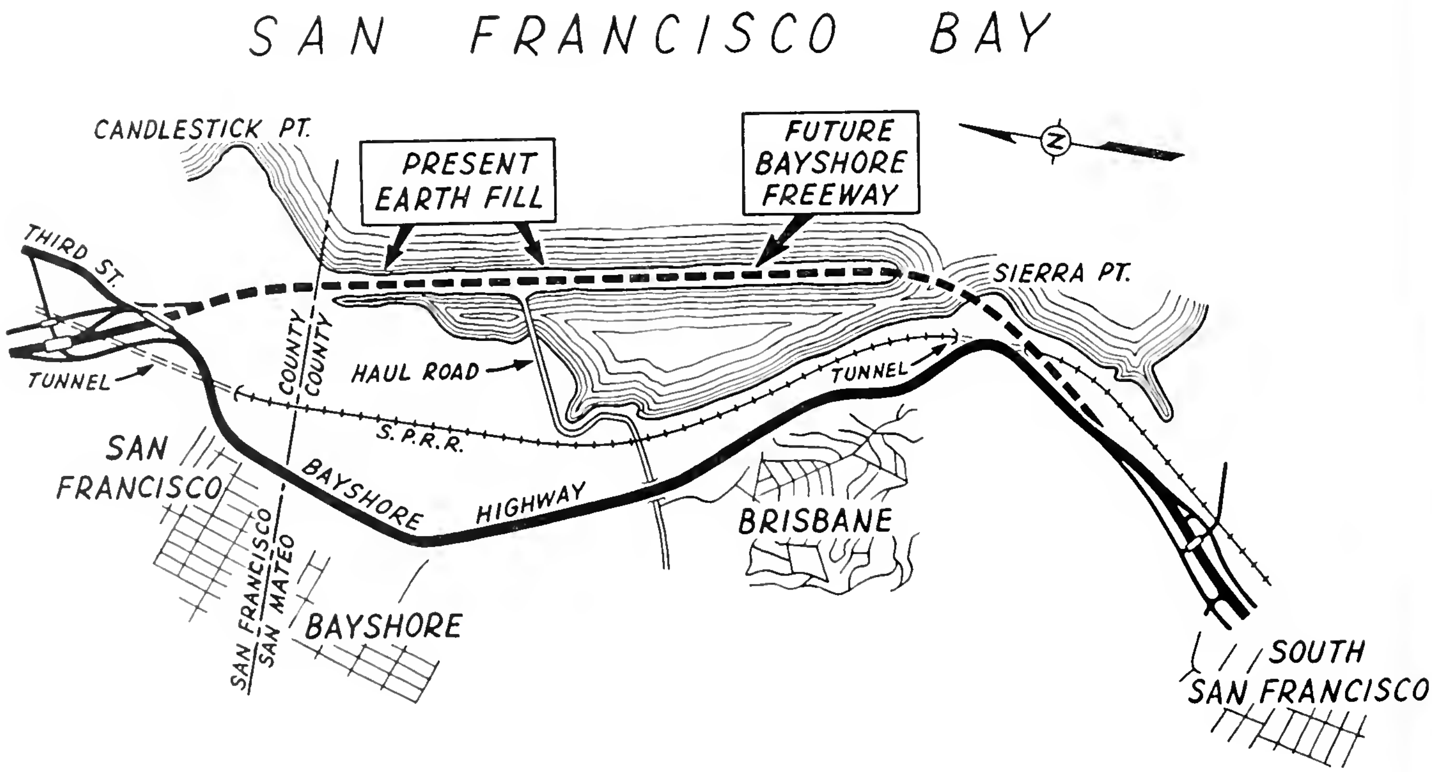
The need for additional highway facilities to handle the increasing traffic between San Francisco and the fast developing peninsula area became apparent in the mid-1930's and numerous traffic studies were made to determine the type and extent of expansion that would best alleviate the growing congestion. Due to the highly developed industrial sections, substandard alignment, grades, and constricted right of way on the existing route through the Visitacion Valley area, it was determined that the most economical and desirable solution was to bypass this area with a new location. This would provide two facilities through this area with a new freeway for through traffic and the existing route to serve local traffic.

Several Routes Studied

Studies of several routes bypassing this area led to recommendation of the present route. It subsequently was adopted and declared a freeway by the Highway Commission in July, 1941.

Since the new route crossed an arm of San Francisco Bay, with underlying mud ranging in depth from a few feet to nearly 80 feet, construction presented a major problem. Comprehensive studies were made to determine the most feasible and economic type of method of building this project. After eliminating the possibility of a causeway the two methods most carefully analyzed and compared were: (1) displacing the mud with dry fill by end dumping and (2) several variations of predredging the mud to provide a reasonably stable embankment with a minimum of mud displacement.

Because of large cuts on each end of the project and the fact that an ample quantity of borrow material was readily available from nearby sources, it was determined that substantial savings would be realized if the end dump mud displacement method would provide a stable embankment. Since this method of construction had never been used on such a large scale with dimensions and conditions resembling those to be encountered, it was questioned whether the fill could be successfully con-



Fill for open water section of Bayshore Freeway across Candlestick Cove. Widening at center of picture is location where reinforced concrete box culverts will be constructed to equalize water level.

structed in this manner. Hence to determine the feasibility of the proposal funds were made available and a contract was let in January, 1952, to construct an experimental section of fill by end dumping.

Mud Fill

Material for this contract was obtained from the right of way and was placed using 20 cubic yard carryalls and tournapulls. The fill was advanced on a 400-foot-wide front in an attempt to float the fill with a minimum of mud displacement. As the fill progressed, it was determined by borings that much greater penetration and displacement of mud was occurring than had been originally estimated. Calculations showed this greater penetration would allow the width to be reduced and still obtain reasonable stability so the fill was advanced further into the bay at a width of 300 feet.

Reducing the width caused greater displacement, so the fill was narrowed again. The remainder of the experimental fill unit was constructed 250 feet wide, being completed in August, 1952.

Based on the success of obtaining a reasonably stable fill over mud of a maximum depth of 40 feet on this first contract, a second experimental project was recommended to be placed by the same method to determine the feasibility of construction over mud which reached a depth of 80 feet.

Overhead Crossing

This second contract was awarded in June, 1953, and it included building an overhead crossing over eight tracks of the Southern Pacific Railroad and nearly two miles of haul road to a borrow site west of the existing Bayshore Highway. To reach the center line of the proposed freeway fill it was necessary to cross 1,200 feet of the bay with the haul road which was to be constructed 30 feet wide over mud that reached a depth of 60 feet. Construction of a fill of this width resulted in nearly 100 percent displacement of the soft bay mud and provided a road over which nearly 3,000,000 cubic yards of fill material has been hauled with only normal grading for maintenance.

The successful completion of this haul road confirmed further the feasibility of the method of construction, so instead of feasibility, our main concern during construction of the second experimental fill became placing the fill in such a manner as to obtain a uniform displacement of mud both laterally and longitudinally.

Uniform Displacement

If the fill could be placed so that a uniform displacement of mud could be obtained, differential settlement would be a minimum and only normal maintenance would be required.

Borings were made during construction to determine the depth of displacement, and records of quantities and methods of placement were correlated with these borings to determine factors affecting displacement.

Numerous variable factors were found that influenced displacement, the prime ones being:

1. The shape of the advancing face of the embankment.
2. The type of equipment used to place the fill material.
3. The rate at which the fill was placed.
4. The elevation at which the fill was carried.
5. Stoppages.
6. The type of material of which the fill was constructed.
7. Strength of the underlying mud.
8. Depth of the underlying mud.
9. Tide action.

A change in any of these factors caused others to vary and resulted in a change in displacement. Controls had to be established and varied during construction to meet the conditions at hand.

. . . *Continued on page 28*

New Expressway

Freeway Through Placerville Completed at Cost of $1,649,000

By P. C. SHERIDAN, Assistant District Engineer, and T. G. SMITH, District Construction Engineer

Modernization of the portion of US 50 between Sacramento and Lake Tahoe is advancing with the completion of two projects; one the portion between near Clarksville and Shingle Springs, a two-lane facility constructed on right of way acquired for future expressway development; and second, and more spectacular, the new expressway through Placerville.

US 50, or the Lincoln Highway as it is sometimes known, and in the past known as the Pony Express Route, follows the general route of the original historic pioneer trail. As an emigrant road, Johnson's "cut-off" gradually increased in popularity and importance, diverting travel from the Carson Pass Road. Its chief advantage was lower elevation with a longer period of freedom from snow. This largely accounted for its being chosen as the route of the transcontinental mail and passenger stages. About 1860, portions were rebuilt between Placerville and Virginia City, a distance of 116 miles, at a cost estimated at $500,000. As much more was spent between then and 1868 for betterments and maintenance, which during the same period was more than repaid by tolls amounting to approximately $6,000,000.

Old State Wagon Road

The first indication of a new era was an act approved March 26, 1895, creating the "Lake Tahoe State Wagon Road" which included the Placerville Road from the junction near Smith's Flat to the Nevada state line. The rights to the toll road had been purchased by El Dorado County and it was declared a public highway in 1886. With the signing of an indenture dated February 28, 1896, it became the first state road in California.

This historic route notes the continuing changes of the times. First as a trail with its strings of mules, the Pony Express and the mountain schooners, followed by Concord coaches to the early gasoline buggy, and on to the modern motor car and powerful motorized freight trucks of today.

With the changes in type of transport, the road itself has undergone necessary changes. Much of the tortuous, winding, narrow highway was reconstructed in the late 1920's and the 1930's by the State Division of Highways and the Bureau of Public Roads, leaving what was then the "tolerable" stretches for later construction.

SHINGLE SPRINGS PROJECT OPENED

The five-mile section of US 50 in El Dorado County, between 2.3 miles east of Clarksville and Shingle Springs, was opened to public traffic on Friday, October 7th.

The new section of highway is entirely on new location, with only a few slight curves, as contrasted with the existing highway which contains numerous sharp curves posted for reduced speeds. The new section has also been built on a wide right of way, and consists of two 12-foot lanes with eight-foot surfaced shoulders.

Construction on this portion of US 50 has been in progress for a little more than a year, at a cost of more than $700,000. The contractor is A. Teichert & Son of Sacramento.

Aerial photo showing realigned US 50 from 2.25 miles east of Clarksville to Shingle Springs. Old route shown with dotted line on right.

Motorists no longer have to contend with the traffic congestion on US 50 through Placerville as shown in these two photographs taken just before completion of the Placerville freeway

Meyers Grade Realignment

Realignment of Meyers Grade from the summit to Lake Tahoe Valley was started prior to World War II, but not completed until after the war. Also, immediately following World War II, the section between Pollock Pines and Fresh Pond was constructed by the Bureau of Public Roads. The State completed projects, also immediately following World War II, between Shingle Springs and near El Dorado, followed within a few years by projects from near Nimbus to White Rock, bypassing the town of Folsom, and the construction of the project just east of Placerville from the railroad crossing near Merryman's to Five-mile Terrace. In 1951 the construction from the foot of Meyers Grade to Mays was completed by the Bureau of Public Roads.

Early in 1948 consideration was being given to the project through Placerville. The route was adopted and declared a freeway by action of the Highway Commission on November 16, 1949.

Route of Freeway

The route as proposed generally follows the course of Hangtown Creek through the city. Placerville lies in the narrow ravine formed by Hangtown Creek with its main street on the south side roughly paralleling the creek. The residential portions of the town follow up the tributary ravines and residences dot the surrounding hillsides. The superseded highway follows Main Street, which with the narrow width, parking, and pedestrian traffic, barely allows for two-way traffic. On some holiday weekends the traffic has been jammed so that it has taken up to an hour to traverse the two miles through the community.

The new expressway follows the course of Hangtown Creek on the north side with the Southern Pacific Placerville Branch tracks located between the highway and the creek.

The new facility is a four-lane divided expressway with grade crossings at Canal Street, Spring Street and Bedford Avenue. These three intersections at grade will be signalized. Pedestrian overcrossings are provided at the former crossing of Coloma Street and at Bedford Avenue. Grade separations without connections to the facility are provided at Clay Street and Locust Street. A complete two-quadrant interchange is provided at Washington Street where the structure spans the railroad tracks and Emigrant Ravine, as well as Washington Street. Ramp connections are provided at the beginning of the project to the old highway and to Coloma Street near the center of town, as well as the connections previously mentioned.

Right of Way Problems

Because of the terrain, residential, commercial and industrial building sites are at a premium in Placerville. As a result, right-of-way acquisition negotiations were made difficult in that in many cases it was necessary to provide substitute facilities. For example, the Christian Science Church, the Shakespeare Club, the Standard Oil bulk plant, and the Southern Pacific Railroad depot and freight handling facilities, as well as many residences had to be relocated. The January-February, 1952, issue of *California Highways and Public Works* contains an interesting account of right-of-way acquisition for this project.

The Placerville Branch of the Southern Pacific Railroad and its interchange with the Camino, Placerville and Lake Tahoe Railroad roughly parallel the new facility throughout most of its length. Because of the restricted width available in the bottom of the ravine it was necessary to relocate most of the railroads' facilities. This work was done by railroad forces under service agreement at a cost which will approximate a quarter million dollars.

Again, because of restricted space available, negotiations with the Placerville Fruit Growers Exchange were complicated. This plant, one of the largest pear packing plants in the world, lies between the railroad and the new facility near the east end of the project.

Started in 1953

Actual construction on the project, other than right-of-way adjustments, started in March of 1953 on a contract for the construction of the Locust Street and Washington Street grade separation structures. This unit was followed successively by a grading contract, a base and surfacing contract, and last, a signal and lighting contract.

LEFT—Looking easterly at beginning of project. Old highway swings right across tracks and Hangtown Creek to follow Main Street. Spring Street (S.S.R. 49) crosses the expressway near center of picture. RIGHT—Looking westerly from near end of project. Washington Street Overhead in foreground. The structure spans relocated Washington Street, the Southern Pacific Railroad, and Emigrant Ravine. Placerville Fruit Growers pear packing plant, one of the world's largest, LEFT CENTER.

Construction problems galore were encountered while building the road. Chief among these was redoing the town's utility systems to make way for the freeway. In a town as old as Placerville, the location of many of the water and sewer pipes was lost in antiquity and it was found most practical to excavate until a pipe was discovered by breaking it with a tractor and then to figure out where the pipe started, whether it was in use, and what to do with it. The difficulty was that while this was being decided some of the town might be out of water, and so immediate action was necessary. However, the townspeople knew the problems that were being faced and were very cooperative. Surprisingly few complaints were received when the vast amount of utility changing is considered.

This photograph shows the Camino, Placerville and Lake Tahoe Railroad truss that was salvaged and used to span a highway grade separation structure to permit the use of over-legal loads during construction

Utilities Relocated

In addition to moving the water and sewer lines, power and telephone lines had to be relocated. The work of railroad relocation was complicated by carrying city traffic across the project at every intersection, and it is obvious a great deal of cooperation was necessary between the various forces on the project in order to get all jobs done at the right time. However, all work was completed with a minimum of delay.

The roadway material consisted mostly of a clayey shale which required some blasting to break it up enough to handle with a power shovel. Fortunarely only a small amount of blasting was necessary.

Many springs were intercepted on the project. At times it was difficult to tell whether the springs were natural or the result of a broken water pipe or septic tank. In order to stabilize the subgrade it was necessary to place about 2,500 feet of perforated metal pipe, some of which drains the year round.

Four Contracts

The work was done under four contracts. The first, early in 1953, was let to Fredrickson & Watson Construction Company, and included the grade separation structures at Washington Street and Locust Street at a cost of $308,000. J. H. Horn of the Bridge Department was rhe resident engineer.

The second contract, the main grading and structure work, was awarded to Piombo Construction Company of San Francisco in January, 1954. The structures included pedestrian overcrossings at Coloma and Bedford Streets. These crossings presented many problems in forming and constructing. Particularly difficult were the ramps circling the columns. This contracr was completed in May, 1955, at a cost of about $875,700. T. G. Smith was resident engineer.

The base and paving contract was awarded to Harms Bros. of Sacramento in May, 1955. The whole length of the project is curbed, and for a time it was believed rhat placing this amount of curb and gutter would prevent the contractor from finishing the project during the 1955 consrruction season. However, this did not prove to be the case, as the contractor moved in an excellent curb and gurter crew and completed enough of this part of the contract so that no delay was encountered. The cost of this unit will approximate $399,365. E. F. Silva was resident engineer.

Lighting System

The fourth and final contract for highway lighring and signals was awarded in September, 1955, to R. Flatland. The lighting is a standard mercury vapor installation, but the signal system is unusual. The equipment includes a traffic actuared cycle selector with railroad pre-emption. Six possible cycles are available in the equipment being installed. The cost of this work approximates $66,000. T. H. Madsen was resident engineer.

An interesting event on the grading project was the discovery of an old mining tunnel. The surface opening had seemingly been lost for many years as none of the old-timers in town could remember this mine being worked, or even where it had started. Whoever had dug the mine was careful to keep his work from prying eyes. The tunnel ran back from the cur slope about 75 feet and showed evidence of very careful hand digging. No shoring had been used and a remarkably small amount of material had sloughed from the sides or top of the tunnel. However, ir looked as though the tunnel was a failure as no evidence of gold was discovered.

During consrruction old-timers in town were observed searching some of the excavarion areas for evidence of gold. So far as is known, no grear strikes were made bur ir is assumed

. . . Continued on page 29

Sherwin Grade

Historic Inyo-Mono Route Will Be Reconstructed

By DOROTHY SHERWIN VELLOM *

On September 20, 1955, the California Highway Commission voted $1,515,000 for grading and surfacing US 395 in Mono County between Birchim Canyon and Whiskey Canyon, a distance of 11.3 miles.

DOROTHY S. VELLOM

Construction will be started next year as soon as weather permits.

The story of Sherwin Hill and Sherwin Grade has its beginning in the life of one of the earliest pioneers in the eastern slopes of the High Sierra. James L. C. Sherwin, called by the lure of the west and its gold, brought his bride from Kentucky, first to Virginia City, Nevada, in 1859, then to Benton, then to Round Valley in 1866 to homestead on Rock Creek. In 1874 he saw the need for building materials so built the road over Sherwin Hill to Rock Creek where he established a sawmill. The family then moved to what is now known as Swall Meadows from where Mr. Sherwin continued to operate the sawmill at the foot of the grade. He developed another sawmill at Mammoth when that became a busy mining camp and built a road from Round Valley to Mammoth. Many, many changes have been made since those early days but both hill and grade bear his name and are still known as Sherwin Hill and Sherwin Grade, though long ago this road ceased to be a private toll road and became a public highway.

This section of Sherwin Grade north of the summit will be modernized to eliminate bad ascent and curves

Project Started in 1915

Factually, Day Labor Work Order No. D-79 dated October 4, 1915, was the formal authorization for state highway construction between the Inyo-Mono county line and Sherwin Hill, a distance of 5.8 miles, on US 395. The day the work actually started is not available from any known records. It is safe to say that on that particular unknown, yet highly historical day in the highway annals of the Inyo-Mono region, no whistles blew, no speeches were made, no traditional first shovelful of earth was turned nor was there any particular significant event marked for posterity.

Very likely work was formally started by some native eastern Sierra Paiute driving a team of mules, banging his Fresno scraper into the warm earth on Sherwin Hill.

First Route Study

Division Engineer Woodson was then in charge of this Inyo-Mono area with headquarters across the mountains in Fresno, and assigned as resident engineer of the first state highway project in what is now known as District IX, the man who actually made the first route and reconnaissance study, C. C. Boyer.

Boyer's originally announced plans were to hire as many local men and teams as available in order to furnish employment to home people. He expressed hopes of completing the grading of about 6 miles of the 10-mile section between September and the time storms would cause a winter shut down. Contemplating a construction project of 10 miles, Boyer evidently was anticipating approval of work northerly from Sherwin Hill. Subsequent work orders proved him correct.

Before work could actually start it was necessary to make innumerable arrangements for labor, equipment, stock, fuel, groceries and supplies of all natures. A camp was set up and maintained for the workmen, it being

* Secretary to District Engineer F. J. Baxter, Bishop, and granddaughter of the original builder of Sherwin Grade.

LEFT—Sherwin Grade, looking south. Dotted line shows proposed relocation. RIGHT—Upper East Mesa, looking south. Proposed relocation to the left; existing State highway on right.

moved from time to time to keep it as close as possible to the job site. When the work site became as far as 2½ or 3 miles away, camp was moved. Camps were tents; the kitchens and dining rooms were constructed in sections which could be bolted together and then covered with canvas. Boyer, as both superintendent and resident engineer, had his office "under his hat."

Early Day Problems

In some cases dry camps were established and then it became a necessity to haul water to the camp sites. This was done in wagon tanks hauled by mule teams. All supplies this first fall were hauled to camp by mule teams. Hay and grain available locally were so purchased but all other supplies were either hauled from Bishop or from Laws which was the railroad point of delivery.

The highway which was actually built up Sherwin Hill was mostly on an 8 percent grade and followed a zigzag development up the slope. Some 40 to 60 men were employed in the construction work, all of whom were on the State's pay roll. Personnel employed was generally local. A few professional mule skinners who followed railroad and highway work made up the skilled labor contingent. Quite a few local Indians were engaged on this project. Work done in the fall of 1915 was grading and minor drainage structures. Wherever the earth was such that it could be moved with teams and scrapers, that method was used. Because of the general scarcity of pure earth material numerous grade changes were made nearly all of which were raises in grade to avoid heavy rock work.

Hand Drilling Necessary

Rock excavation was done by drilling and blasting; hand drilling was of necessity done. The blasted material was removed by stoneboats and mules and by wheelbarrows. Where no earthy material was encountered for smoothing off the roadbed it was necessary to complete the grade with borrow material wherever it could be found.

For the next 40 years this road as herein described continued to serve ever increasing traffic needs with only surface changes.

It is a sincere tribute to our early road builders and a marvel that they could build so well with so little with which to do.

January, 1916's, headlines carried the news of one of the worst storms in eastern Sierra history. This storm had the effect of closing down the newly inaugurated highway project for a period of about three months. Four feet of snow on Sherwin's slopes plus extremely cold weather made productive work on the road impossible. It wasn't until late March before the snows had melted and the temperatures risen sufficiently that the construction men were able to resume their labors. In April, 1916, the first truck was assigned to this area. It was a two-ton truck, chain driven and equipped with solid tires. This truck was put on the Laws-Bishop-to-camp route carrying needed supplies and materials. The original field book showing the log of trips, type of cargo and cost of repairs is still available and makes interesting reading in itself. The first car assigned to this area was a four-door sedan used by Boyer.

Unit Completed in 1916

By June, 1916, the grading and structures were essentially completed to Sherwin Summit. In order to continue on the much needed northerly descent from Sherwin Summit into Rock Creek, Day Labor Word Order No. D-101 was issued under date of April 4, 1916, for 4.8 additional miles. The same crews and camp setup arrangements were used in what amounted to a continuation project northerly under Boyer's direction. While this extension work was under way funds were made available to provide a penetration oil surfacing to this 5.8-mile section up Sherwin.

Because the Owens Valleyites in their travels northerly could witness the completion of the grading work it was only natural that they should burn with a desire to try out the new road. Boyer appealed to the traveling public in every way to forego trying to go through the new work. During one weekend 90 cars were counted traveling over the new road. Such heavy traffic through construction made it necessary for Boyer to establish road control hours during the last two weeks of the construction period. No one was allowed through the job from 7 to 11.30 a.m. or from 1 to 4.30 p.m.

Celebration Held

Having worked so long and diligently for highway progress in this area it was only natural that the people of Inyo-Mono should desire to celebrate their first highway project completion with a colossal whing ding. The local newspaper carried headlines in large capital letters and in the framed center of the front page the following announcement: "Celebration of Sherwin Hill Conquest to Occur One Week From Monday in Rock Creek Canyon." Invitations were sent to the owners of 300 license cars to come and bring as many friends as their cars would hold, as well as a basket lunch except meats and coffee which would be provided.

The actual ceremony occurred on September 4, 1916, when about a thousand people shared the pleasures of an outing on Rock Creek when El Camino Sierra's first unit was auspiciously dedicated. For 35 years since J. L. C. Sherwin created his toll road over that rock strewn slope and into the canyon beyond, humans and horses had expiated their sins on its punishing climb and descent.

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LEFT—Looking south from Whiskey Canyon, showing existing route and proposed relocation. RIGHT—Looking north from Bircham Canyon showing proposed relocation on right.

Redwood Empire

Convention Cites Need for Federal Highway Appropriations

PRESSING NEED for many additional millions of dollars in highway construction appropriations was accented during Redwood Empire Association's 35th Annual Convention at Hoberg's in Lake County, October 20th-22d.

Particular emphasis was laid on the need for new federal-aid funds.

The convention was one of the most successful and heavily attended in the association's long record in behalf of highway development, tourist-vacationist traffic promotion, and related activities. Organization policies were set on a wide range of issues affecting the present and future welfare of the Empire although the main themes of discourse related to highway and highway problems.

Long List of Notables

The official and public interest with which the association's activities are viewed was attested to by the long list of notables who attended the Governor's dinner the closing night of the convention. A crowd of 450 filled the huge dining room to virtual capacity. Speakers included U. S. Senators William F. Knowland and Thomas H. Kuchel. Toastmaster was Robert R. Gros of San Francisco, Vice President of Pacific Gas & Electric Company, who returned recently from a month behind the Iron Curtain.

Unable to attend the function because of his absence from the State, Governor Goodwin J. Knight was officially represented by State Director of Public Works Frank B. Durkee, Chairman of the California Highway Commission. Representing Governor Paul Patterson of Oregon was Niel R. Allen of Grants Pass. Official greetings from the California Highway Commission were extended by Commissioner F. Walter Sandelin of Ukiah.

Robinson Reelected President

Presiding at the Governor's dinner as well as at other major functions of the convention was Reed W. Robinson of San Francisco, who was elected to a second term as president. He was presented by Arthur J. Schilder of Ukiah, a past president. Robinson paid singular tribute to the organization's veteran general manager, Clyde Edmondson of San Francisco, whom he introduced as "Mr. Redwood Empire." Edmondson has been directing head of the association since 1925.

REED W. ROBINSON

Others at the speaker's table included State Senators A. W. Way and James E. Busch, and Assemblymen Frank P. Belotti and Ed Gaffney. Senator Busch welcomed the association's representatives and guests on behalf of the citizens of Lake County.

State and federal officials at the dinner included: T. Fred Bagshaw, Assistant State Public Works Director, who served for many years on Redwood Empire Association's Executive Board; R. H. Wilson and B. W. Booker, Assistant State Highway Engineers; C. E. Bovey, Cooperative Projects Engineer; Milton Harris, Construction Engineer; A. E. Elliot, Bridge Engineer; Alan S. Hart, L. A. Weymouth and J. P. Sinclair, District Engineers; C. A. Maghetti, Highway Commission Secretary; Kenneth C. Adams, Editor, and Robert Rose, cameraman, *California Highways and Public Works* magazine; Peter Mitchell, President, and Ralph Bell, Press Relations Officer, State Public Utilities Commission; Forest Fiorini, Chairman, California Aeronautics Commission and Clyde P. Barnett, Director of Aeronautics; F. H. Raymond, State Forester; John L. McLaughlin, State Department of Motor Vehicles; J. Stuart Watson, Assistant Executive Officer, State Lands Commission; Ralph Phillips, U. S. Bureau of Public Roads Engineer; Webb Kennedy, Chief Engineer, U. S. Forest Service; and Fred T. Johnson, U. S. National Park Service.

Other guests included: Russel Ells, President, California Redwood Association; Harold J. McCurry, Past President and Edwin J. Moore, General Manager, California State Automobile Association; Archie D. Stevenot, President, Mother Lode Highway Association; Frank E. Marsh, Executive Vice President, San Francisco Bay Area Council; Vincent Cooper, Assistant General Manager, County Supervisors Association of California; and many others.

Senator Kuchel Urges Highway Legislation

Durkee and Allen delivered messages from the governors of their respective states pledging energetic support of sound highway programs aimed at eliminating traffic hazards and otherwise improving highways linking California and Oregon.

Although Knowland devoted a major portion of his address to international affairs, he strongly endorsed Kuchel's earlier call for bipartisan support of President Eisenhower's recommendations for an adequate interstate system of highways.

Kuchel blamed politics for the defeat of the President's multibillion-dollar highway program in the last session of Congress.

Supervisors Unit

The supervisors unit, the association's policy-setting body on highways and legislative matters, met prior to the Governor's dinner. In furtherance of some of its long-established policies, the unit reiterated its intentions to

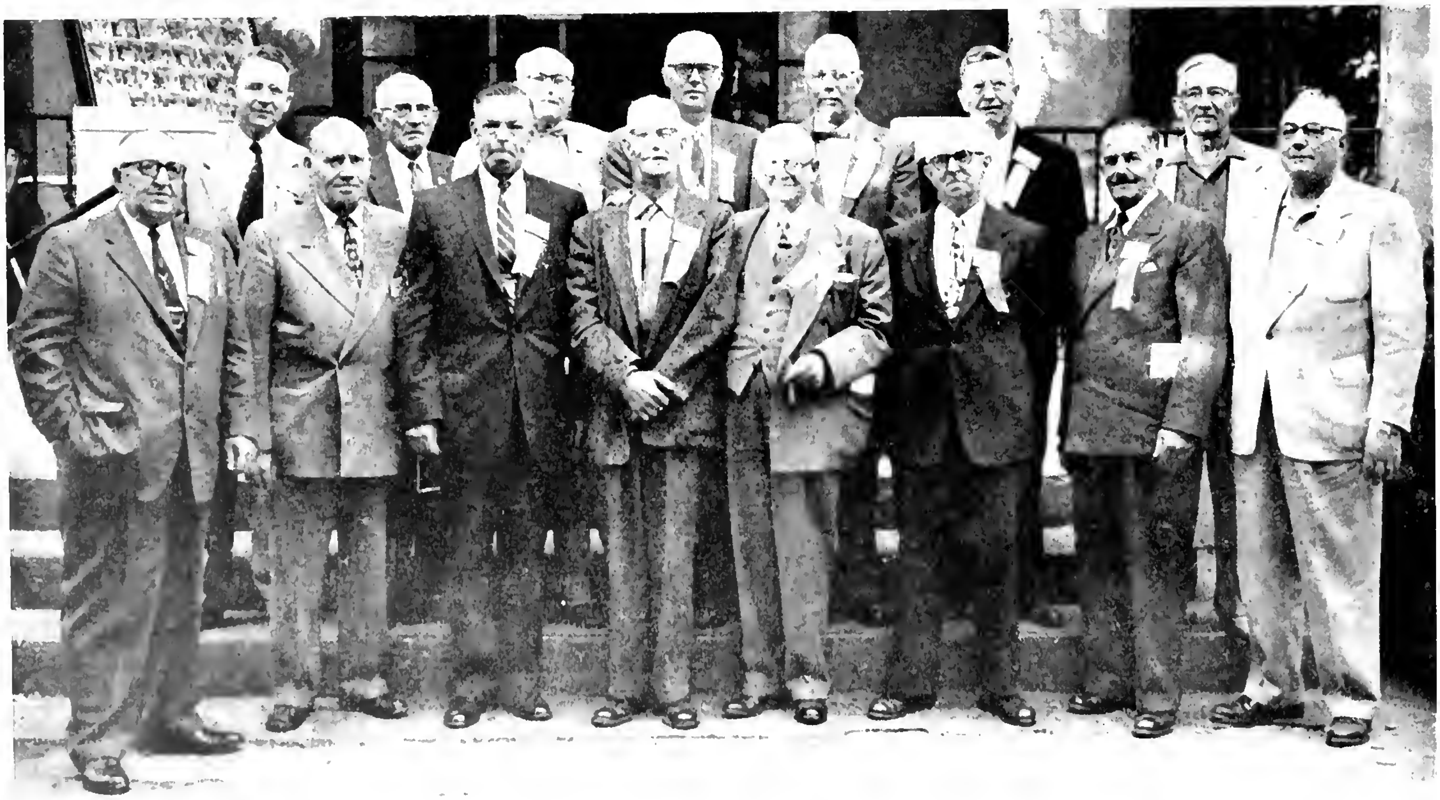
1. Continue its campaign to promote additional federal-aid highway construction appropriations in all classifications.

2. Increase its efforts to bring about the inclusion of US 101 and US 199 in the national system of interstate highways;

3. Campaign to promote additional federal funds for the U. S. Forest Service highways. U. S. Forest Serv-

Frank H. Bartholomew, New York City (right), President United Press Association, was featured speaker at newspaper publishers unit breakfast session during the annual convention Redwood Empire Association at Haberg's, October 22. Ukiah publisher, Ben A. Cober (center), presided as president of the publishers unit. At left is Earle W. Fullerton, Mendocino County vice president.

OFFICERS AND EXECUTIVE BOARD MEMBERS, REDWOOD EMPIRE ASSOCIATION FOR THE NEW FISCAL YEAR 1955-56. FRONT ROW LEFT TO RIGHT—Board member George H. Allen, General Manager Clyde Edmondson, President Reed W. Robinson, San Francisco; Past President Leo H. McLeod, Fortuna; Senator A. W. Way, President Shoreline Highway Association; Association Counsel Elliot M. Epsteen, San Francisco; Albert F. Beecher, Josephine County (Oregon); Unit President Leland J. Guglielmetti, Santa Rosa. BACK ROW LEFT TO RIGHT—Lake County Vice President Don Emerson; Unit President E. R. Freyer, Piercy; Board member Ted Huggins, San Francisco; Marin County Vice President Elias S. Day; Judge Raymond A. Lathrop and Josephine County Vice President Edwin S. Heydenburk, Grants Pass; Sonoma County Vice President Harry S. Graham.



ice roads and trails and for other federal highway projects;

4. Pursue with increased vigor its campaign for repeal of the remaining 10 percent federal transportation tax against persons.

Chairmaned by its president, Earle W. Wrieden of Middletown, the supervisors unit unanimously decided that the association should continue to coordinate certain phases of its programs with those of the National Association of Travel Organizations, American Association of State Highway Officials and other influential groups in an effort to realize some of its major objectives.

Shoreline Highway

The unit also adopted into policy a series of recommendations of Shoreline Highway Association, a Redwood Empire Association affiliate of which Senator Way is president, calling for important highway improvements in Marin County and along the Empire coastline.

During the final convention assembly, resolutions were unanimously adopted expressing appreciation to Governors Knight and Patterson; the State Highway Commissions of California and Oregon; Director of Public Works Durkee; George T. McCoy, State Highway Engineer, and other officials and engineers of the State Division of Highways; U. S. Bureau of Public Roads; U. S. Forest Service; federal and state legislators, for their interest in state and federal highway projects and legislation, and for funds allocated for highway improvements.

Other public officials who participated in unit and committee sessions were: Assemblyman Lloyd W. Lowrey; Harold B. LaForge, Engineer, Federal-aid Secondary Highway Projects; William L. Berry, Principal Hydraulic Engineer, State Division of Water Resources; Ruben Johnson, representing Division and District Engineers, Corps of Engineers, U. S. Army; Kenneth A. Brown, Deputy Real Estate Commissioner; Homer F. Potter, acting Regional Director, Small Business Administration; Randall Ward, President, California Mission Trails Association; Henry T. Maschal, nationally known research analyst; and Frank H. Bartholomew of New York, President, United Press Association, who was the principal speaker at the newspaper publishers unit breakfast.

PLUMAS COUNTY BRIDGE RECEIVES AWARD

This is the bridge given an honorable mention award by the American Institute of Steel Construction

California Division of Highways received recognition for the appearance of one of its structures this month when honorable mention award was received from the American Institute of Steel Construction in its annual competition for the bridge over Indian Creek in Plumas County. This structure on the scenic Feather River Highway bridges Indian Creek near Keddie, where it joins Spanish Creek to form one of the forks of the Feather River. The structure is composed of two riveted girders, six feet deep, supporting a 28-foot concrete roadway. The single shaft concrete piers add to the trim lines of the finished structure. The new 248-foot bridge was completed August 24, 1954, replacing an old 327-foot timber deck truss structure built in 1929.

The award states: "This bridge was chosen because it is well integrated with the mountainous landscape, hardly an episode, but seemingly continuous with the rugged highway construction."

PLANS ARE MAPPED FOR ARBA ROAD SHOW AND CONVENTION

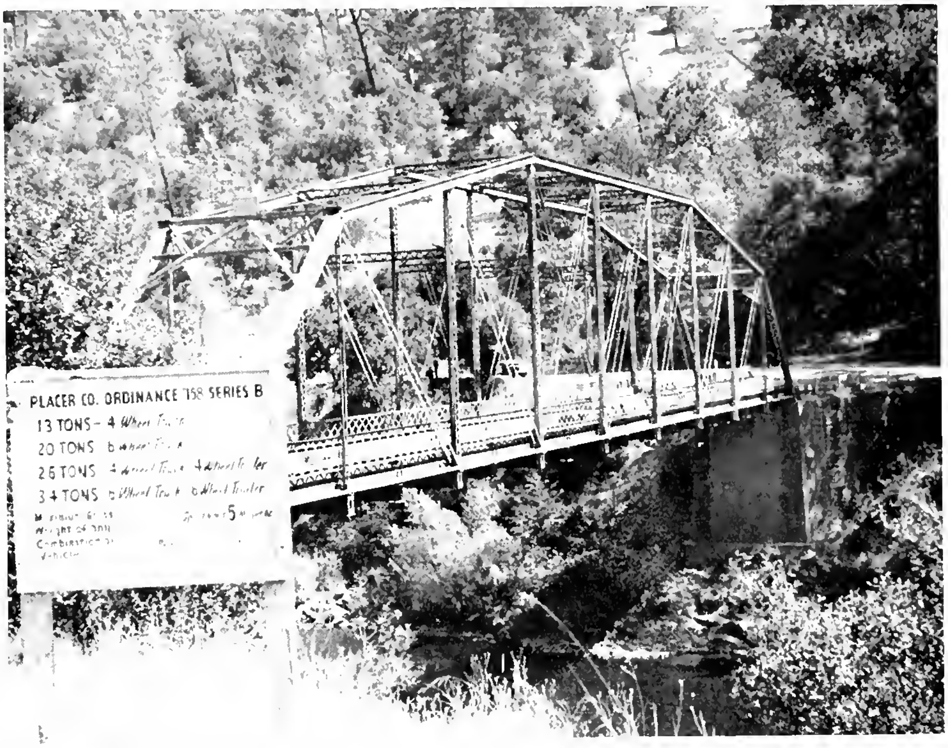
Plans for the 1957 American Road Builders' Association Annual Convention and International Road Show are developing fast. Preliminary arrangements for the show, which will exhibit all types of heavy construction machinery, were worked out by representatives of ARBA and CIMA (Construction Industry Manufacturers Association) in September.

The most spectacular indoor exhibition of its kind ever held will draw tremendous throngs to the enlarged Chicago Amphitheater from January 26 to February 3, 1957. Space exceeding 300,000 square feet will be devoted to the equipment display. Delegates from every state and from most foreign countries, representing all branches of government and industry, will participate in the brilliant convention program to be offered by ARBA and in the special activities of the road show.

PLACER COUNTY USES FAS FUNDS TO REPLACE OUTMODED BRIDGE

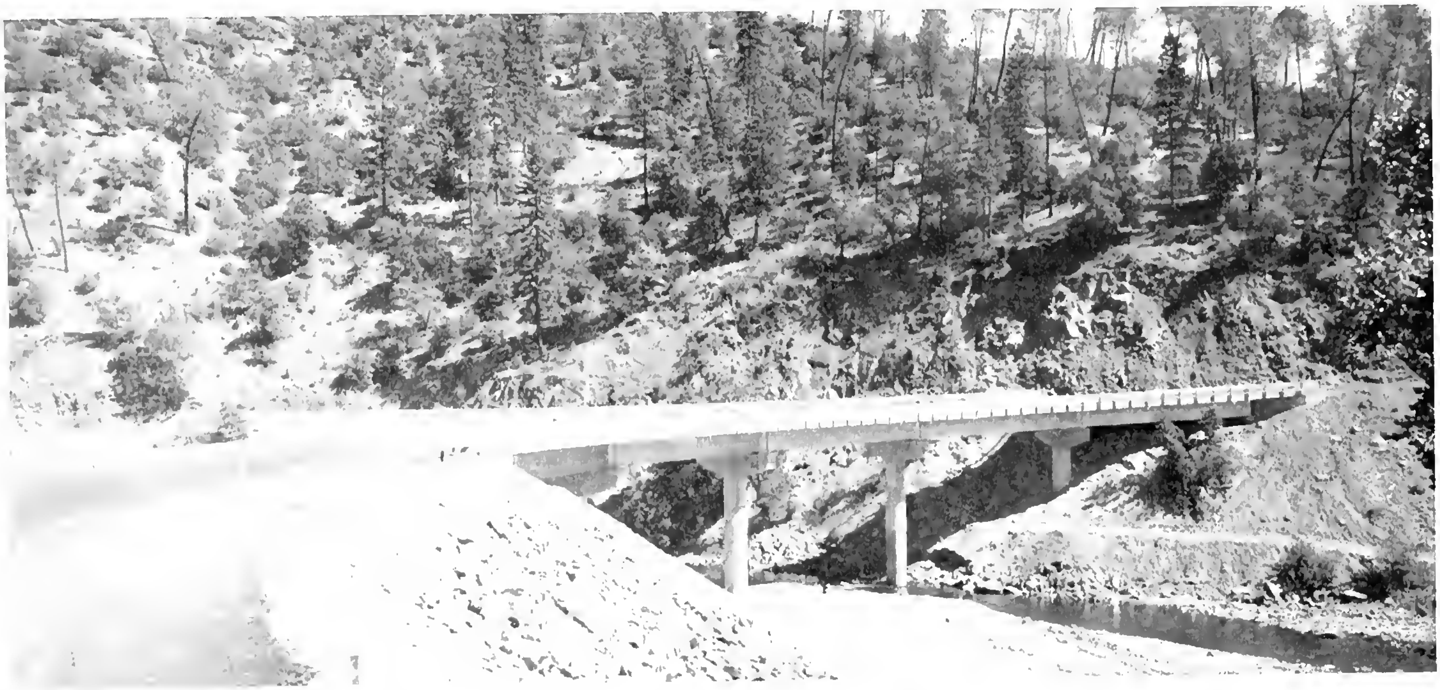
By HERBERT E. ABELL, Road Commissioner

The Mother Lode country has removed another obstacle to modern transportation by the completion of a new bridge across the north fork of the American River in Placer County, three miles east of Auburn. The bridge lies on the historic route of the '49ers between Auburn and the fabulous placers of the American River Basin, the Foresthill Divide and the Town of Foresthill. Prior to 1862 the old timers forded or ferried the river at this point but soon recognized the advantage of a dry crossing and constructed a low level wooden bridge. Between that time and 1911 several wooden structures and a combination truss bridge served the traffic of those times. In 1911 a steel bowstring truss bridge was erected serving traffic on a one-way basis until 1944 when it was deemed necessary to strengthen the structure to adequately provide for the ever-increasing loads. Even with this added reinforcement it was necessary to ford the stream with overweight out-size equipment needed for present-day logging operations.



A new bridge downstream constructed by Placer County under the Federal Air Secondary Highway Program replaced this narrow steel truss bridge which served the Foresthill area between 1911 and 1955

Close-up of Placer County new FAS bridge



Two different views of the new bridge across the North Fork of the American River in Placer County

Current average daily traffic is approximately 700 vehicles, made up of the trucks that haul 60,000,000 feet of lumber to market annually, and all of the people engaged in that production, a vestige of the '49ers and those of our cities who have found the peace of solitude in the vast recreational area served.

Designated FAS Road

With advent of the federal-aid secondary program for county roads in 1944, the people of Placer County and particularly those of the Foresthill Divide were given hope of relief from some of the inadequacies of their vehicular transportation system. Accordingly, the county road from State Highway No. 49 to Baker Ranch, via Foresthill, was designated as FAS Route 767, connecting with the $3,000,000 Mosquito Ridge forest access road terminating at Foresthill, and other important access roads which provide the outlet for forest products to the ever-demanding market. A project, correcting the deficiencies of the grade climbing easterly out of the Middle Fork Canyon, was initiated and constructed with three fiscal year allotments of federal-aid secondary highway funds plus matching funds made available by the County Highway Aid Act of 1945, the California Construction and Employment Act of 1946 and the county. County projects of stage construction and stepped up maintenance activities have, in part, kept apace of traffic.

No. 1 Deficiency

By 1952 the bridge constructed in 1911 had become the No. 1 deficiency of the entire county primary road system. The county programmed a federal-aid secondary project to correct this deficiency. In January, 1954, foundation investigations, preliminary surveys for approaches and the procurement of other pertinent data were initiated. The determination of the most economical and most suitable type of structure was made immediately after adequate data were obtained. Of economic consideration was the proposed use of the area as the reservoir site for the downstream

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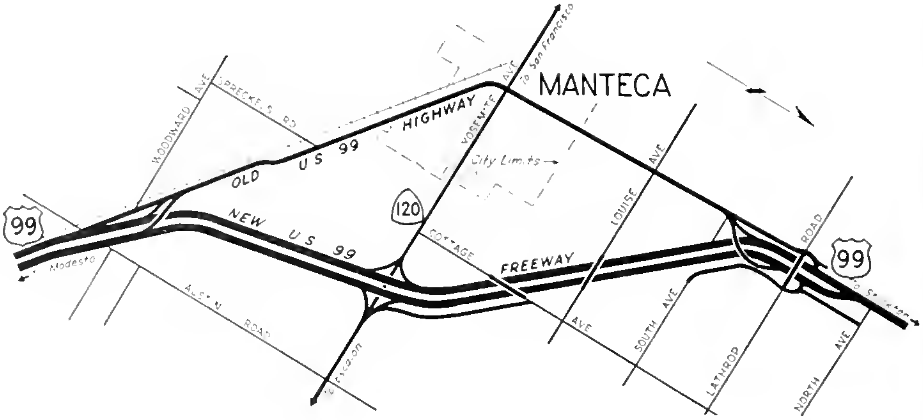
Manteca Freeway

Major Traffic Bottleneck On US 99 Is Broken

By K. N. HATCH, Resident Engineer



WITH THE opening to traffic of the Manteca Freeway early in November of this year, a major traffic bottleneck on US 99 was broken.

This unit east of Manteca is the third section of full freeway to be opened to travel on US 99 in District X. The 4.6-mile relocation consists of a four-lane divided highway with full control of access. It eliminates some 5.7 miles of two-lane highway through the very center of the Manteca business area, three railroad grade crossings and a highway intersection at grade controlled by four-way "stop" signs.

Can Be Expanded

In designing the four-lane facility, provisions were incorporated to allow expansion to six lanes when such a need developed. The through lanes have been constructed of portland cement concrete on cement-treated subgrade, and ramps and frontage roads are paved with plant-mix on untreated base. Intermediate weakened plane joints were sawed and paper joints provided at 60-foot intervals.

Imported borrow was obtained from a site one mile southeast of the project. The procurement of borrow material in this area presents a number of problems due to the level terrain, the highly developed agriculture and the water table. This subject was discussed by Sam Helwer in this year's May-June issue of *California Highway and Public Works.*

Six structures were required. Partial interchanges to serve traffic to and from Manteca were provided at the north and south ends; a full interchange at the new intersection of US 99 and Route 66 replaces the old intersection at grade, and separation structures serve local traffic on Cottage Avenue, Louise Avenue and on Lathrop Road. Frontage roads were constructed between Route 66 and Cottage Avenue and between South Avenue and North Avenue connecting with Lathrop Road east of the overcrossings.

All structures are reinforced concrete and consist of two continuous box girder spans supported on reinforced concrete center bents and hollow type reinforced concrete abutments on reinforced concrete piling, except the south Manteca overcrossing which consists of but a single span.

These two photographs show the traffic congestion in Manteca at the intersection of Yosemite Avenue, State Route 66, and Main Street, US 99, which was a daily occurrence before completion of the Manteca Freeway

The new route traverses a highly developed agricultural area served by the South San Joaquin Irrigation District. It was necessary for the contractor to schedule the placing of reinforced concrete pipe for eight irrigation ditches and four drainage ditches so as to provide uninterrupted irrigation service.

Irrigation System

Because of a high water table, the contractor selected the "well-point" system in placing irrigation structures. He drilled a series of shallow wells at 12- to 15-foot intervals and backfilled with a pervious material which facilitated the percolation of water into the wells where it could be removed by means of small pumps. This system lowered the water table sufficiently to allow the placing of concrete pipe without difficulty.

Some 60 parcels of land, containing a total of 193 acres, were acquired for right of way on the new freeway. With the exception of two parcels requiring condemnation, all property was acquired by mutual agreement with the owners. The cost of land and improvements was $560,000 and utility relocations amounted to $50,000.

Troublesome Bottleneck

The former highway was constructed in 1925 and consisted of two concrete lanes. The northern portion traversed Main Street, the major north-south business thoroughfare in Manteca. The intersection of Main Street with Yosemite Avenue (State Route 66) has been a bottleneck to traffic and a source of dissatisfaction to both motorists and residents of Manteca.

The intersection of these two narrow streets impeded the movement of trucks which had difficulty negotiating the short radii returns, and the four-way stop signs introduced additional delay to traffic. Residents of Manteca and the surrounding area found it difficult to shop in Manteca due to vehicular congestion and lack of parking areas.

Modernization of US 99 and State Route 66 through Manteca has been under study for a number of years. The first major step towards achieving this goal was an origin and destination study conducted in 1948 and 1949.

Aerial view of Manteca Freeway, looking south, showing Cottage Avenue and Louise Avenue separation structures

Destination Survey

From a total of 21,000 vehicles, 20,000 driver interviews were conducted. The results indicated that 60 percent of the north-south traffic desired to bypass Manteca and that 35 percent of traffic west of Manteca on Route 66 entered or left the south leg of US 99. In removing the route from Manteca, it is estimated that the traveling public will save $14,000,000 in 20 years because of reduced transit time and distance. These and other factors were considered in determining the ultimate routing and on March 18, 1953, the California Highway Commission adopted the present route as a freeway.

Bids were received June 30, 1954, and the contract awarded to A. Teichert and Son of Sacramento who bid $1,821,227.40. Collins Electric Company of Stockton was the successful bidder on the lighting contract at $27,777.77.

Adolph Bauer was the contractor's superintendent and Eric Nordlin was Bridge Department representative for the State.

Work commenced August 5, 1954, and the scheduled date for completion is in December. Because one approach to the Lathrop Road overcrossing would block use of the old highway at the north end of the project, it was necessary to have the freeway open before constructing this approach. For this reason, the contractor's operations continued some eight weeks after the project was opened. During this period, local traffic on Lathrop Road was served by a system of frontage roads and portions of the old highway and the new freeway.

Bay Bridge

New East Bay Distribution Structure Opened to Traffic

By WILLIAM TRAVIS, District Construction Engineer

On October 24, 1955, the final portions of the newly reconstructed East Bay distribution structure were opened to traffic. The occasion was marked by ribbon-cutting ceremonies at the site and a luncheon-reception sponsored by the Alameda County Highway Advisory Committee. The guests were welcomed by President Norris Nash of the Oakland Chamber of Commerce and Chester E. Stanley of the Alameda County Highway Advisory Committee acted as chairman of the day. Speakers included Director of Public Works Frank B. Durkee, B. W. Booker, Assistant State Highway Engineer in charge of District IV, Assemblyman W. Byron Rumford, Mayor Clifford E. Rishell of Oakland and Supervisor Kent D. Pursel of Alameda County.

View looking easterly, showing East Bay distribution structure as originally constructed in 1936

View looking easterly, showing East Bay distribution structure as reconstructed

The original interchange at this location was placed in service in 1936 when the San Francisco-Oakland Bay Bridge was first opened to traffic. The design provided interchange of Bay Bridge traffic, Eastshore Freeway traffic and traffic from MacArthur Boulevard. While the original design was extremely advanced in its conception it did contain weaving sections 550 feet in length which have for some years been greatly overtaxed by reason of the tremendous increase in traffic in the East Bay. The design, however, did provide a full directional interchange with relatively high speed ramp design.

Third Traffic Level

The new construction provides a third level of highway traffic by the construction of separate ramps to interchange traffic between MacArthur Boulevard and either the Bay Bridge or the Eastshore Freeway. This construction completely eliminates the weaving sections of the original structure. Because, however, of the excellence of the original design the greater part of the original structure remains in service to interchange traffic between Cypress Street and either the Bay Bridge or the Eastshore Freeway.

The main line of the Southern Pacific railroad runs through the interchange area as does the Key System Interurban Line which passes beneath the Southern Pacific tracks. Consequently, there are five separate levels of traffic in the completed interchange.

Of primary importance in the design of the new facility was the necessary provision for the 120,000 vehicles which daily pass through the interchange. Several designs were developed which, upon completion, would adequately serve traffic but which designs were discarded when no practical means could be worked out to serve traffic during construction.

Directional Interchange

The design finally adopted provides a full directional interchange with an ultimate capacity of 240,000 cars daily. Traffic service throughout construction was provided by the inclusion of two timber detour bridges at a cost of $150,000. The use of these detour bridges was so correlated with construction of the new facility as to provide full traffic service at all times.

Construction of the new ramps was started in March, 1954, under contract by MacDonald, Young and Nelson, Inc., and Morrison-Knudsen Co., Inc. Completed at a cost of $4,500,000 the new construction includes 10,000 linear feet of new elevated structures which, together with about 6,000 linear feet of the original structure, amounts to roughly three miles of viaduct in the interchange area.

Northerly of the interchange the Eastshore Freeway has been reconstructed as an eight-lane modern facility to the El Cerrito overhead. Southerly of the interchange the $6,000,000 contract for the construction of a double-deck viaduct along Cypress Street is progressing rapidly. Plans are also being prepared for the reconstruction of MacArthur Boulevard to full freeway status. Completion of these projects will establish a system of the highest type of highway facilities throughout the metropolitan East Bay.

Pictured at reception sponsored by Alameda County Highway Advisory Committee are, left to right—B. W. Booker, Assistant State Highway Engineer, District IV; W. A. Sparling, General Manager, Oakland Chamber of Commerce; Mayor Clifford E. Rishell, Oakland, with his grandson, Dennis King, in center.

TEHAMA COUNTY SECTION OF US 99E COMPLETED

Paving on the section of Route 99E in Tehama County between the Butte county line and Los Molinos has been completed. This culminates five years of planning and construction under five contracts on the part of the Division of Highways. It likewise represents the expenditure of approximately $2,000,000.

The work accomplished consisted of widening all the bridges and structures. In the case of irrigation pipes, many of these were leaking and had to be replaced as well as lengthened.

The alignment of the improvement varies in only a few locations from the original alignment. However, the old grade had a number of short pitches and rolls which restricted sight distance. All of these have been removed.

The new surface is 40 feet wide. This provides two driving lanes 12 feet wide with eight-foot shoulders. This section has been found to be the most suitable design for two-lane roads The inclusion of these wide shoulders provides a place for a disabled vehicle to park and a maneuver area for vehicles to operate. They definitely help to reduce accidents.

The roadbed is supported on imported subbase (gravel) material, generally from 3 to 15 inches thick, dependent upon the results of tests of the bearing value made of the underlying material in the grade. Upon this is a cement treated base six inches thick with a three-inch plant mix surface.

J. W. Trask, District Engineer of the Division of Highways at Redding, expressed his gratification over bringing the section of 99E in this district up to current standards.

Trask said that as in the case of all present day state highway construction, the facility was designed to meet the needs of the traveling public for the next 20 years on this route. With the care that was used in estimating the traffic needs, the attention given to all details in the design and the care and attention given to the actual construction, he feels the highway will be entirely adequate.

Cajon Pass

Improvements on Historic Route Eliminate Two-lane Road

By C. G. BEER, Assistant District Engineer

Four-lane divided expressway replaced the former two-lane road over a long and important segment of historic Cajon Pass in San Bernardino County on October 13, 1955. Griffith Company, contractor for construction of a 17.4-mile section of US 66-91-395, opened the new construction to traffic on that date. The summit of the pass is included in the newly completed section, which extends from 0.5 mile south of Gish Underpass to Palmdale Road. Work started on this $1,860,000 contract on April 20, 1954, and is expected to finish on schedule. A. Kinnamon has been superintendent of construction for Griffith Company, and H. C. Prentice and Tom Borman represented the State as resident engineers.

As is indicated by the photographs, the provision of four lanes in this area will greatly expedite the passage of faster traffic around heavy trucks slowed by the grades of the pass. It is also anticipated that closure of the highway under ice and snow conditions will be considerably reduced. These conditions occur several times each winter. They have, in the past, been aggravated by the difficulties of maneuvering traffic on the two-lane road. Many of the closures have been caused as much by traffic blockades as by the snow and ice which were present.

Important Gateway

The history of Cajon Pass, one of the important gateways through the mountains surrounding Southern California, was traced in an article pub-

. . . *Continued on page 40*

LEFT—Gish Underpass as widened to four-lane divided roadway. RIGHT—Approaching Cajon Pass from the south

LEFT—Summit of Cajon Pass. The old replaced highway is shown on the right. RIGHT—Construction view taken immediately south of Cajon Pass Summit.

View of open water section of fill for Bayshore Freeway across Candlestick Cove, Sierra Point in foreground. Both railroad and highway will be relocated across the Point to the right of existing facilities. Purpose of railroad relocation is to provide additional tracks. Freeway will be carried over railroad on structure on solid ground at Sierra Point.

"OPEN WATER" FILL

Continued from page 9

Effects of Stoppages

Using the information and experience gathered on the two experimental fills, specifications were prepared designating the shape of nose, type of equipment, constant rate of production and the use of dynamite placed in the mud ahead of the fill to overcome the detrimental effects of stoppages. Fortunately, the majority of material obtained from the borrow site was very uniform and rocky in nature, ideal for placement in the mud. Using these controls, the elevation at which the nose was carried, and the rate at which the fill was advanced was varied to correlate with the depth and strength of the underlying mud, type of material, and the positon of the

SUMMARY OF COMPLETED FILL PROJECTS

Contractor	Cu. Yds. Placed	Sta. Limits	Inclusive Dates
Edward Keeble Co.*	418,000	6 + 00 to 20 + 00	Jan., 1952-Aug., 1952
Guy F. Atkinson Co.†	956,000	35 + 00 to 56 + 00	Sept., 1953-June, 1954
Guy F. Atkinson Co.	1,953,000	56 + 00 to 110 + 00	Aug., 1954-Oct., 1955
John Delphia Co.	450,000	20 + 00 to 35 + 00	May, 1955-Oct., 1955
Excess Material from Projects in S. F.	230,000	20 + 00 to 35 + 00	Jan., 1952-Sept., 1955
Total	4,007,000		

* First experimental project. † Second experimental project.

tide. This procedure gave satisfactory results in obtaining uniform displacement of mud on the two filling contracts just completed.

It is estimated that an additional quantity of 1,200,000 cubic yards of fill will be required to complete the embankment. This material is being placed under the current contract on which work was recently started. Included in this contract is the construction of an overpass over the railroad tracks at Sierra Point and box culverts to equalize the water level in the lagoon that will be enclosed by the freeway embankment. One more contract will be required to cover the paving of this freeway bypass. It is expected that bids for this final project will be called for in 1956, in coordination with progress on the current contract so as to provide a continuous freeway from the central district of San Francisco to the heart of the peninsula at the earliest possible date.

NEW EXPRESSWAY

Continued from page 13 . . .

that a small amount of color was discovered.

Old Trestle Removed

Another interesting problem was the removal of an old railroad trestle and truss structure used by the Camino, Placerville and Lake Tahoe Railroad. The structure was replaced by a grade crossing at Washington Street. The railroad company removed the rails from the structure, but it became the responsibility of the contractor to remove the remainder. The contractor wanted to use the truss portion to place over one of our structures so he could use overweight roadway equipment, and therefore wanted to save the truss at all costs. Dismantling and loading the structure without dropping it gave everyone some bad moments, but the project was completed successfully and the end results of building a bridge over a bridge gave the contractor an economical hauling arrangement.

This 1.5-mile new facility will save through motorists from five minutes to an hour in time, depending on traffic volumes, and will provide for easier circulation of local traffic on Main Street.

Bay Bridge Is One Of Seven Modern Engineering Wonders

Included in the Seven Modern Engineering Wonders of the United States designated by the American Society of Civil Engineers is the San Francisco-Oakland Bay Bridge. This world-famous span was designed and built under the personal supervision of the late Charles H. Purcell, State Highway Engineer and later Director of the Department of Public Works of California.

The other projects named are:

Chicago Sewage Disposal System—involving Herculean excavation; reversal of the flow of the Chicago River and construction of the world's largest treatment works.

Colorado River Aqueduct—serving 66 municipalities in Southern California with water brought almost 250 miles, traversing desert and mountains and involving part canal, part tunnel and part siphon.

Empire State Building, New York City—tallest building man has constructed.

Grand Coulee Dam and Columbia River Basin Project, Washington—an irrigation marvel; has world's largest hydroelectric power plant.

Hoover Dam, Arizona-Nevada—world's highest.

Panama Canal—greatest of geographical surgical operations; of distinguished service to entire world.

MONTHLY TRAFFIC COUNTS

Regular monthly traffic counts for October, 1955, show an increase of 6.8 percent over October, 1954. They show a decrease of 5.7 percent under September, 1955. Based on a five-year average, October counts normally show a decrease of 5.5 percent under September.

For the first 10 months of 1955 the monthly counts show an increase of 5.5 percent over the same period of 1954.

Comparing October, 1955, with October, 1954, passenger vehicles show an increase of 6.9 percent and freight vehicles show an increase of 6.8 percent. Freight vehicles represented 20.3 percent of the total week-day traffic.

Posts in Division of Water Resources Temporarily Filled

The following temporary assignments in the Division of Water Resources, effective November 2d, were announced by Frank B. Durkee, Director of Public Works:

Harvey O. Banks, Assistant State Engineer, in addition to his regular duties with respect to water rights and water quality investigations, assumed the duties of State Engineer.

State Engineer A. D. Edmonston retired from state service on November 1st.

Walter G. Schulz, Principal Hydraulic Engineer, took over the duties of G. H. Jones, Assistant State Engineer, in charge of flood control projects and supervision of safety of dams.

Jones retired from state service effective November 1st.

William L. Berry, Principal Hydraulic Engineer, assumed the duties of T. B. Waddell, Assistant State Engineer, in charge of state-wide investigations and related matters.

Waddell retired from state service on November 1st.

The three staff members to whom the assignments have been made are not being appointed to the vacancies resulting from the retirement of their superiors, Durkee stated. They will continue to carry on their regular duties for the time being.

Civil service examinations for the position of Assistant State Engineer will be held.

The State Personnel Board has not been requested to hold an examination for the position of State Engineer. This will make it possible for the Legislature in March of next year to have a free hand in discussing the formation of a new Department of Water Resources without having to consider the vested rights of any individual with respect to the position of State Engineer.

STIFF PENALTY

The maximum penalty for drunken driving in South Africa, says the California State Automobile Association, is a $2,800 fine or 10 years in prison, or both.

SHERWIN GRADE

Continued from page 16 . . .

Colorful Ceremonies

The ceremonies took place in a deep, rocky cut before reaching the summit across which was a barrier of vines and flowers. On the upper side a band of mounted Indians in paint and feathers typifying the old order rode up to the barrier while the official car was driven to the opposite side by a charming young lady who took a machete from the auto and walked to the barrier as the brown chief of the Paiutes raised his hand in the command to halt. After a brief parley the cord was severed and the procession permitted to pass. The Pathe moving picture people were reeling in many feet of dedication views and mountain scenery while the head chef served some 575 steaks and 200 pounds of trout. Such an auspicious dedication and celebration was only the beginning of what was then known as El Camino Sierra, now US 395.

This first project covering grading, structures and oiling of the 5.8 miles of Sherwin Hill was finally reckoned to cost $44,928. Of this total $38,621 were for teams, equipment and labor, $3,317 for materials and $2,990 for engineering. The companion project from Sherwin Summit down to Rock Creek was eventually totaled up to cost the State $18,982, broken down into $18,651 for labor, supplies, teams and equipment, $13 for materials and $318 for engineering.

About 1927 or 1928 there was some discussion of a 5 percent route on the easterly mesa. Late in 1931 the question came up again and funds were provided to cover a complete study of the problem but before the reconnaissance report stage was reached all work was dropped suddenly. In April, 1948, a representative of Headquarters Office and the district engineer explored the possibilities of several routings, from which it appeared necessary to develop a grade line on the possible eastern routing, or Mesa line, and a formal request for $1,000 was made for preliminary studies.

A project report dated December 17, 1953, was submitted covering the proposed 12.0-mile relocation between Birchim Canyon and Whiskey Canyon and an aerial survey was made. The route adoption map filed September 3, 1954, for presentation at the September meeting of the Highway Commission met with favorable action. This was a preliminary step toward relocation of a 12-mile section of US Highway 395 (Three Flags Highway) north of Bishop, Inyo County, to eliminate the Sherwin Hill-Rock Creek Grade bottleneck and other steep pitches and sharp curves.

Employees Receive Twenty-five-year Awards

Employees of the Division of Highways who became eligible for 25-year awards during October and November, 1955, are:

Name	Total service Yrs.	Mos.	Days
ELIGIBLE ON October 31, 1955			
District I			
Snyder, Charles W.	25	0	24
District IV			
Ray, Serge	25	0	1
District VI			
Anderson, George F.	25	0	8
District VII			
Elster, Margaret	25	0	20
Central Office			
Deardorff, Herbert H.	25	0	18
Hines, Grace Marie	25	0	23
Ledden, Charles T.	25	0	28
MacLachlan, K. A	25	0	1
ELIGIBLE ON JUNE 30, 1955			
District III			
Potts, Earl C.	25	0	11
District V			
Banick, Dewey L.	25	0	13
Lamb, Albert L.	25	0	6
Snyder, Charles H.	25	0	15
District VII			
Rockfellow, George E.	25	0	22
District VIII			
Lasater, Roy M.	25	0	29
Bridge Department			
Dykstra, Aldrich D.	25	0	27

A BOW TO YOU, BILL

MR. KEN ADAMS, *Editor*

DEAR MR. ADAMS: May I join the great number in congratulating you on the excellence of the format, art work and display of *California Highways and Public Works*, which performs a great service in keeping the public abreast of major highway construction projects, perhaps the most important single problem confronting our State.

Kindest personal regards

Sincerely

W. A. SPARLING
General Manager

LONGEST STREET

Figueroa Street in Los Angeles, which extends for 22½ miles, is the longest city street in California.

WINTER ROAD REPORTS

Closer teamwork than ever before between the State Division of Highways and the California Highway Patrol in keeping state highways open despite snow and ice conditions will be possible this winter through the use of radio.

The two state agencies have completed installations of receiving equipment in Highway Patrol cars, highway maintenance vehicles and local headquarters whereby the patrolmen and maintenance workers will hear each other's messages concerning road and traffic conditions, weather, and accidents and other emergencies.

This winter the intercommunication radio system will be installed in the Donner Summit area of US 40 and the Ridge Route section of US 99.

At the same time the Division of Highways announced that its system of state-wide road condition reports covering state highways subject to adverse weather will be extended this winter to cover the entire Pacific Coast, by an exchange of information with the States of Washington and Oregon. Information on main highways in Nevada has been available to California on an exchange basis for the past three years.

SAN FRANCISCO BAY

San Francisco Bay encloses more than 450 square miles of water.

New Budget

Highway Agency Votes Total of $247,338,000 for Construction

A STATE HIGHWAY BUDGET providing $247,338,000 for major construction purposes for the 1956-57 Fiscal Year has been adopted by the California Highway Commission.

The new state highway budget, the largest ever adopted in California, contains a grand total for all state highway purposes of $310,721,600, including maintenance and other items. The construction items include $163,360,000 for major projects, including construction engineering, and $83,978,000 for acquisition of rights of way for future construction.

The $247,338,000 for major construction purposes exceeds by $23,443,000 the comparable allocations for the 1955-56 state highway budget as revised in December, 1954. Almost half of the increase—$10,000,000 represents a portion of the reimbursement to the State Highway Fund, as provided by the Legislature, of previous expenditures for the operation and maintenance of the San Francisco-Oakland Bay Bridge. The rest of the reimbursement, approximately $7,000,000, has been incorporated in the 1955-56 state highway budget.

Early Start on Construction

A faster than usual start on construction of some of the newly budgeted projects has been made possible by a law enacted at the 1955 Session of the Legislature, permitting award of state highway contracts as early as January 1st, six months before the start of the budget year. This provision will enable the Division of Highways to advertise some of the projects for bids within the next few weeks, permitting earlier opening of road improvements to traffic through maximum use of favorable construction weather. Under previous state law, contracts could not be awarded before April.

In addition to highway and bridge improvements on many rural routes, the projects included in the new state highway budget provide for the completion or extension of many multilane freeway and expressway projects both within urban areas and on long stretches of intercity highways.

Freeway Projects

For example, freeway projects budgeted for 1956-57 in Tulare, Fresno, San Joaquin and Sacramento Counties will, when completed, provide a multilane divided highway on US 99 between the Los Angeles area and Sacramento approximately 360 miles long, continuous except for less than a mile of four-lane undivided highway at two railroad separations and short sections through a few northern San Joaquin Valley cities.

Other major freeway projects in the budget will complete the 38-mile section of the Eastshore Freeway from Oakland to San Jose; extend the Bayshore Freeway 7.5 miles to the San Mateo-Santa Clara county line, and complete the four-mile over water section across Candlestick Cove; and provide 7.5 miles of freeway construction on US 101 in the San Fernando Valley.

Additional major projects will convert most of the remaining multilane divided sections of the Santa Ana Freeway to full freeway by construction of separation structures and frontage roads, and extend it 10 miles to El Toro, Orange County. With the 10 miles of the Hollywood Freeway already in operation, and the freeway construction completed, under way or newly budgeted on the Santa Ana Freeway, this will provide 53 miles of continuous full freeway, except for intersections at grade at Orangethorpe and Magnolia Avenues where separation structures are planned but not yet financed.

Added Freeway on US 101

On other sections of US 101, additional freeway and expressway construction is scheduled in Santa Barbara, San Luis Obispo, Marin, Sonoma, Mendocino, Humboldt and Del Norte Counties. Two projects in San Luis Obispo County, when completed, will make US 101 a continuous four-lane freeway and expressway for more than 65 miles between north of Santa Maria and San Miguel, except through the cities of Arroyo Grande and Pismo Beach.

On US 40 in Contra Costa County, freeway construction now under way

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Commission Adds $7,060,000 to Its Current Road Funds

The California Highway Commission on October 19th added $7,060,000 in construction and rights of way to the Northern California portion of the State Highway Budget for 1955-56 representing part of the additional funds made available by virtue of a refund from San Francisco-Oakland Bay Bridge toll revenues.

Largest item included in the current budget is an allocation of $2,050,000 for widening of the Eastshore Freeway from four lanes to six lanes between High Street in Oakland and San Lorenzo.

Another $900,000 was allocated for acquisition of a new vessel for the Benicia-Martinez Ferry.

The remaining $4,110,000 consisted of allocations for acquisition of rights of way, as follows:

Alameda County, US 50 (MacArthur Freeway in Oakland), $1,800,000.

Contra Costa County, Sign Routes 21 and 24 in the Lafayette-Walnut Creek-Danville area, $1,230,000.

San Mateo County, Bayshore Freeway, between San Mateo and the Santa Clara county line, $700,000.

Santa Clara County, San Jose-Los Gatos-Campbell area, various portions, $380,000.

The remaining approximately $10,000,000 from the $17,000,000 Bay Bridge refund to the State Highway Fund will be incorporated in the 1956-57 State Highway Budget, not yet adopted by the commission.

Construction Projects in State Highway Buc

County	Route	Description	Approximate mileage	Estimated cost
Alameda	5	Foothill Boulevard—North city limit of Hayward to Mattox Road; grade and pave for 6-lane divided highway	1.3	$800,000
Alameda	69 (SR 17)	Eastshore Freeway—Warm Springs to Beard Road; grade, pave, and structures for 4-lane freeway (completes 38 miles of Eastshore Freeway between Oakland and San Jose)	9.0	5,785,000
Alameda	69 (SR 17)	Eastshore Freeway in Oakland—Magnolia Street to 17th Street; structure (completes freeway viaduct between Distribution Structure and Market Street)	0.8	2,650,000
Alameda	227	Mountain Boulevard in Oakland, between US 50 and SR 24 (portions); grade and surface continuing cooperative freeway project with City of Oakland and County of Alameda		300,000
Alameda	Various	Rights of way on state highway routes		4,991,000
Butte	45	At Cherokee Canal; bridge and approaches		205,000
Butte	47 (SR 32)	Chico to Hog Springs; grade and surface, initial two lanes of ultimate 4-lane expressway	4.9	680,000
Butte	Various	Rights of way on state highway routes		52,000
Calaveras	24 (SR 12)	0.1 mile east to 1.8 miles east of Valley Springs; grade and surface on new location	1.7	235,000
Calaveras	Various	Rights of way on state highway routes		115,000
Contra Costa	14, 106 (US 40)	South of Hilltop Dr. (Co. R. 24) to north of north city limits of Hercules; grade, pave, and structures for 6-lane freeway (connects to beginning of Carquinez Toll Bridge project)	4.9	6,800,000
Contra Costa	Various	Rights of way on state highway routes		2,225,000
Del Norte	1 (US 101)	At Panther Creek, bridge and approaches	0.1	80,000
Del Norte	1 (US 101)	De Martin's Ranch to 1 mile north of Wilson Creek; grade, surface and structure for 4-lane expressway	1.1	640,000
Del Norte	Various	Rights of way on state highway routes		65,000
El Dorado	11 (US 50)	Five-mile Terrace to east of Camino; grade, surface and structure for 4-lane expressway	3.3	970,000
El Dorado	Various	Rights of way on state highway routes		175,000
Fresno	4 (US 99)	Santa Clara Street to San Joaquin Street; grade, pave and structures for 6-lane freeway (completes freeway through Fresno)	1.2	1,930,000
Fresno	41 (SR 180)	B Street to Broadway; grade, pave and railroad grade separation structures on Stanislaus and Tuolumne Streets	0.6	1,500,000
Fresno	41 (SR 180)	Ten-mile Creek Bridge, redeck		25,000
Fresno	76 (SR 168)	Chestnut Avenue to 0.13 mile north of south city limits of Clovis (portions); grade, surface and widen bridges on existing highway		40,000
Fresno	125 (SR 41)	Shields Avenue to 0.3 mile north of Shaw Avenue; grade and pave for 6-lane divided highway	2.3	600,000
Fresno	125 (SR 41)	0.4 mile north of Herndon Avenue to San Joaquin River; revise road approaches for control of access		25,000
Glenn	Various	Rights of way on state highway routes		60,000
Humboldt	1 (US 101)	0.4 mile north of Fernbridge to 0.7 mile north of Hookton Road; grade and structures for 4-lane expressway	4.4	1,130,000
Humboldt	1 (US 101)	0.2 mile south of Elk River to south city limits of Eureka; grade, surface and structures for 4-lane highway	1.4	300,000
Humboldt	1, 20 (US 101, 299)	0.6 mile north of Plaza Avenue to 1 mile south of Mad River Bridge on US 101, and from new interchange to Mad River Bridge on US 299; grade and surface (structures now under contract), for 4-lane expressway connecting with 8 miles of expressway north of Eureka	3.7	715,000
Humboldt	1 (US 101)	At Turner Draw, Bridge and approaches		65,000
Humboldt	20 (US 299)	Willow Creek to South Fork Trinity River Bridge; base and seal coat	4.2	125,000
Humboldt	Various	Rights of way on state highway routes		625,000
Imperial	187 (SR 111 and 115)	Orita Turn to Brawley (portions); grade and surface (widening and reconstruction)	6.7	590,000
Imperial	187	At Alamo River, redeck bridges 9 miles north of Brawley and 3 miles east of Brawley		26,000
Imperial	Various	Rights of way on state highway routes		548,000
Inyo	Various	Rights of way on state highway routes		20,000
Kern	33 (US 466)	Between Lost Hills and Wasco, replace four bridges and approaches		165,000
Kern	57 (SR 166) (SR 33)	Maricopa to US 99 (portions), grade and surface for drainage correction	1.9	250,000
Kern	58 (US 466)	Sivert to Sand Cut, grade and surface	1.3	45,000
Kern	58 (US 466)	Between Sivert and Bear Mountain Ranch, construct two cattlepasses and approaches		25,000
Kern	58 (US 466)	Cameron Road to Big Cache Creek; grade, surface and structure (widening and some realignment)	5.6	455,000
Kern	139	Central Valley Highway, 4.9 miles south to 2.8 miles south of Wasco (portions); grade and surface (widening and some realignment)	2.1	100,000
Kern	Various	Rights of way on state highway routes		4,115,000
Kings	Various	Rights of way on state highway routes		5,000
Lake, Mendocino	15 (SR 20)	0.2 mile east of Cold Creek to Laurel Dell; grade and surface (including relocation)	3.2	640,000
Lake	89 (SR 29)	At Thompson Creek and Thompson Creek Overflow, bridges		50,000
Lake	Various	Rights of way on state highway routes		50,000
Lassen	Various	Rights of way on state highway routes		80,000
Los Angeles	2, 159 (US 101)	Hollywood Freeway—Lankershim Boulevard to 0.1 mile north of Moorpark Street; grade, pave and structures for 8-lane freeway	1.1	2,350,000
Los Angeles	2 (US 101)	Ventura Freeway—Sepulveda Boulevard to Encino Avenue; grade, pave and structures for 8-lane freeway	2.6	2,970,000

SR = State sign route

t for 1956-57 Fiscal Year Are Approved

County	Route	Description	Approximate mileage	Estimated cost
Los Angeles	2 (US 101)	Ventura Freeway—Kelvin Avenue to Calabasas; grade, pave and structures for 6 and 8-lane freeway	3.8	$3,300,000
Los Angeles	4, 161 (US 99) (US 6)	Golden State Freeway—Glendale Boulevard to 0.5 mile north of Los Feliz Boulevard; grade, pave and structures for 8-lane freeway	1.4	1,690,000
Los Angeles	4, 161 (US 99) (US 6)	Golden State Freeway—0.5 mile north of Los Feliz Boulevard to 0.9 mile south of Los Angeles River Bridge near Victory Boulevard and connection to San Fernando Road near Colorado Boulevard; grade, pave and structures for 8-lane freeway	1.3	3,200,000
Los Angeles	4 (US 99)	North of Los Angeles city limit to Kern county line (portions); surface		440,000
Los Angeles	9 (US 66)	Huntington Drive and Foothill Boulevard Monrovia to Azusa Underpass (portions); channelization and signals		150,000
Los Angeles	26 (US 70, 99) (US 60)	San Bernardino Freeway in West Covina and Baldwin Park, Barranca Avenue and Bess-Frazier Avenue Interchange; structures and approaches		560,000
Los Angeles	158 (SR 7)	San Diego Freeway—McHelen Avenue to Florence Avenue (Redondo Boulevard); borrow site		1,500,000
Los Angeles	158 (SR 7)	San Diego Freeway—0.2 mile south of Valley Vista Boulevard to 0.2 mile north of Burbank Boulevard; grade, pave and structures for 8-lane freeway	1.8	4,565,000
Los Angeles	162 (SR 2)	Glendale Freeway—Los Angeles River to Eagle Rock Boulevard; grade, pave and structures for 6-lane freeway (includes Taylor Yard railroad overhead)	1.6	3,270,000
Los Angeles	166, 2 (US 101)	Santa Ana Freeway—Marianna Street to Camulos Street; grade and pave (widen freeway to 8 lanes)	2.3	500,000
Los Angeles	167 (SR 15)	Long Beach Freeway—0.3 mile south of Imperial Highway to Florence Avenue; grade, pave and structures for 4-lane freeway	2.8	4,915,000
Los Angeles	173 (SR 26)	Olympic Freeway—Santa Ana Freeway to Harbor Freeway (portions) structures for future 8-lane freeway		1,000,000
Los Angeles	Various	Rights of way on state highway routes		42,415,000
Madera	4 (US 99)	Califa to Merced county line; grade and pave for 4-lane freeway	7.0	2,900,000
Madera	125 (SR 41)	San Joaquin River to 1.5 miles north; revise road approaches for control of access		20,000
Madera	Various	Rights of way on state highway routes		10,000
Marin	1 (US 101)	Alto Intersection to 0.6 mile north of Greenbrae Intersection (portion); grade, pave and structures for 6-lane freeway (including Corte Madera interchange)	3.5	2,700,000
Marin	1 (US 101)	At Forbes Station; grade, pave and structure (widen and reconstruct overhead)		430,000
Marin	8 (SR 37)	At Novato Creek, reconstruct bridge		10,000
Marin	69	Tiburon Street to near San Quentin Wye, grade, surface and structures for 4-lane freeway	2.1	900,000
Marin	Various	Rights of way on state highway routes		288,000
Mariposa	18 (SR 140)	4.0 miles west of Mariposa to Mariposa; grade and surface (widening and some realignment)	4.0	325,000
Mendocino	1 (US 101)	0.5 mile south of Ridgewood Summit to 0.5 mile north of Northwestern Pacific Railroad Crossing; grade, surface and structure (extension of new 5-mile expressway)	2.0	610,000
Mendocino	1 (US 101)	0.5 mile north of Hilvilla to 1 mile south of Irvine Lodge; structures for future 4-lane expressway		825,000
Mendocino	1 (US 101)	0.4 mile south to 1 mile north of Tan Oak Park; drainage tunnel (for channel change)		45,000
Mendocino, Lake	15 (SR 20)	0.2 mile east of Cold Creek to Laurel Dell; grade and surface (including relocation)	3.2	640,000
Mendocino	48 (SR 128)	Coon to Ornbaun Creek; grade and surface (on new location)	0.8	155,000
Mendocino	56 (SR 1)	At Brush Creek, bridge and approaches	0.3	157,000
Mendocino	Various	Rights of way on state highway routes		255,000
Merced	4 (US 99)	At Atwater, Canal Creek to Grove Avenue; grade, pave and structures for 4-lane freeway	4.5	2,500,000
Merced	Various	Rights of way on state highway routes		340,000
Modoc	28 (US 299)	8 miles east of Adin to Pit River; base and surface	9.2	295,000
Mono	40	Pole Line Road, US 395 to Nevada state line (portions); grade	21.7	125,000
Mono	96	Sweetwater Road, Walker Reservoir to Nevada state line (portions); reconstruction	8.5	180,000
Mono	Various	Rights of way on state highway routes		10,000
Monterey	2 (US 101)	Two miles south of San Ardo to Salinas River (portions); replace two bridges		285,000
Monterey	56 (SR 1)	At Limekiln Creek, bridge and approaches	0.2	360,000
Monterey	Various	Rights of way on state highway routes		395,000
Napa	49 (SR 29) (SR 128)	4.0 miles north of St. Helena to Calistoga; grade and surface for initial two lanes of ultimate 4-lane expressway	3.7	545,000
Napa	Various	Rights of way on state highway routes		250,000
Nevada	15 (SR 20)	0.4 mile west of Casey's Corner to Rough and Ready (portions); grade and surface (reconstruction and widening)	2.1	90,000
Nevada, Sierra	38 (US 40)	Near Floriston to Nevada state line; grade and surface for 4-lane expressway	5.4	2,600,000
Nevada	Various	Rights of way on state highway routes		235,000
Orange	2 (US 101)	San Diego and Santa Ana Freeway—El Toro Road to Laguna Road; grade, pave and structures for 4-lane freeway	4.6	1,865,000
Orange	2 (US 101)	Santa Ana Freeway—0.3 mile south of Laguna Road to 0.3 mile north of Browning Avenue; grade, pave and structures for 4-lane freeway	5.7	3,280,000
Orange	175 (SR 14)	Route 175 Freeway—Route 174 to 0.2 mile east of Route 2; borrow site		300,000
Orange	185	Laguna Road, mile 7.0 to US 101; grade, pave and structures, widening and some realignment	1.9	300,000
Orange	Various	Rights of way on state highway routes		3,150,000

SR=State sign route

County	Route	Description	Approximate mileage	Estimated cost
Placer	17, 37 (US 40)	1 mile east of Newcastle to Elm Avenue in Auburn; grade, pave and structures for 4-lane freeway	3.1	$1,300,000
Placer	37 (US 40)	Heather Glen to Colfax; grade, surface and structures for 4-lane expressway	6.1	3,250,000
Placer	37 (US 40)	Colfax to 3 miles west of Gold Run; grade, surface and structures for 4-lane expressway	6.5	3,900,000
Placer	Various	Rights of way on state highway routes		224,000
Plumas	Various	Rights of way on state highway routes		40,000
Riverside	26 (US 70, 99) (US 60)	Indian Avenue Interchange at Garnet; structure and approaches	0.3	200,000
Riverside	43 (US 91) (SR 18)	Arlington Avenue to 14th Street; grade, pave and structures for 4-lane freeway	2.1	1,800,000
Riverside	64 (US 60, 70)	At Blythe Crossing of Colorado River; California share of new bridge (cooperative project with Arizona)		595,000
Riverside	146	Imperial County Line to US 60-70 (portions); base and surface, widening and some re-alignment	2.5	180,000
Riverside	187 (SR 111)	At Palm Canyon Wash, bridge and approaches	0.3	220,000
Riverside	Various	Rights of way on state highway routes		2,095,000
Sacramento	4 (US 99) (US 50)	1.8 miles south of Cosumnes River to 0.2 mile south of Elk Grove Road; grade, pave and structures for 4-lane freeway (completes budgeting of freeway between Lodi and South Sacramento)	5.9	2,250,000
Sacramento	11 (SR 24)	Freeport Boulevard—0.4 mile north of Florin Road to 0.1 mile north of Sutterville Road (West); grade and pave for 4-lane divided highway	2.5	650,000
Sacramento	11 (US 50) (SR 16)	Folsom Boulevard—65th Street in Sacramento to Perkins; grade, pave and structures (widening to 4 lanes and additional Brighton Underpass)	2.0	700,000
Sacramento	Various	Rights of way on state highway routes		1,005,000
San Benito	Various	Rights of way on state highway routes		160,000
San Bernardino	31 (US 66) (US 91)	Victorville Overhead and Mojave River, bridges and approaches (for 4-lane freeway)	1.2	1,500,000
San Bernardino	43 (US 395) (US 91) (SR 18)	Mill Street to Fifth Street; grade, pave and structures for 4-lane freeway	1.2	1,700,000
San Bernardino	43 (SR 18) (SR 30)	Lakeview Point to Big Bear Dam (portions); grade and surface (widening and some re-alignment)	1.6	450,000
San Bernardino	59 (US 466)	0.2 mile east of Hinkley R.R. Crossing to north junction of US 91; grade and surface (widening and some realignment)	7.3	200,000
San Bernardino	58 (US 66)	Needles to 3 miles west of Colorado River; grade, surface and structures (initial 2 lanes of 4-lane expressway)	8.5	1,200,000
San Bernardino	Various	Rights of way on state highway routes		2,477,000
San Diego	12 (US 80)	0.9 mile west of 70th Street to 0.6 mile east of 70th Street; grade, pave and structure for 4-lane freeway	1.5	605,000
San Diego	12 (US 80)	0.4 mile west of La Mesa Boulevard to Chase Avenue in El Cajon; grade, pave and structures for 4-lane freeway	1.9	2,720,000
San Diego	200 (SR 94)	Wabash Freeway to 0.6 mile east of Euclid Avenue; grade, pave and structures for 6-lane freeway	2.4	2,295,000
San Diego	Various	Rights of way on state highway routes		3,066,000
San Francisco	2 (US 101)	Lyon St. to State Sign Rt. 1 connection; grade, pave and structures for 8-lane freeway	1.3	3,900,000
San Francisco, San Mateo	68 (US 101 Bypass)	Bayshore Freeway—0.3 mile north of Butler Road to Salinas Avenue; pave (completes 8-lane freeway across Candlestick Cove)	4.1	1,435,000
San Francisco	224	Embarcadero Freeway—Fremont Street to Broadway; grade, pave and structures for 8-lane freeway	1.2	5,300,000
San Francisco	Various	Rights of way on state highway routes		2,270,000
San Joaquin	4 (US 99)	Kinglsey Road to Mariposa Road; grade, pave and structure for 4-lane freeway	2.9	1,190,000
San Joaquin	4 (US 99) (US 50)	0.6 mile south of Mokelumne River to 0.5 mile north of Jahant Road; grade, pave and structures for 4-lane freeway	4.8	2,350,000
San Joaquin	5, 66 (US 50) (SR 120)	Mossdale to Richards Avenue (south of French Camp) and Sign Route 120 Connection, grade, pave and structures for 4-lane freeway	6.1	1,800,000
San Joaquin	Various	Rights of way on state highway routes		360,000
San Luis Obispo	2 (US 101)	Hourihan Grade to Russell Turn; grade, pave and structure for 4-lane expressway	7.0	1,720,000
San Luis Obispo	2, 33 (US 101) (SR 41)	On US 101 from 0.3 mile south of Paso Robles to 0.8 mile north and on Sign Route 41 from US 101 to Huer Huero Creek; grade, pave and structures (4.1 miles of 4-lane freeway on US 101 and 2.7 miles of relocation on SR 41)	6.8	3,150,000
San Luis Obispo	56 (SR 1)	Oso Flaco Underpass, new structure and approaches	0.7	290,000
San Luis Obispo	56 (SR 1)	At Arroyo Grande Creek, bridge and approaches	0.3	90,000
San Luis Obispo	Various	Rights of way on state highway routes		400,000
San Mateo	56 (SR 1)	1.0 mile south of Pigeon Point to Lake Lucerne; grade and surface including some re-alignment (State's share, Joint Highway District No. 9 project)	3.8	285,000
San Mateo-San Francisco	68 (US 101 By-pass)	Bayshore Freeway—0.3 mile north of Butler Road to Salinas Avenue; pave (completes 8-lane freeway across Candlestick Cove)	4.1	1,435,000
San Mateo	68 (US 101 By-pass)	Bayshore Freeway—0.6 mile north of Marsh Road to Bransten Road; grade, surface and structures (extension of 6-lane freeway)	3.8	4,000,000
San Mateo	68 (US 101 Bypass)	Bayshore Freeway—0.4 mile north of Marsh Rd. to 0.2 mile north of Willow Rd.; grade, surface and structures (extension of 6-lane freeway)	2.0	1,700,000
San Mateo, Santa Clara	68 (US 101 Bypass)	Bayshore Freeway—0.3 mile south of Willow Road to 0.1 mile south of Santa Clara county line; grade, surface and structures (extension of 6-lane freeway)	1.8 1.8	1,500,000
San Mateo	Various	Rights of way on state highway routes		1,350,000
Santa Barbara	2 (US 101)	Elwood to Orella; grade and pave for 4-lane expressway	9.0	2,675,000

SR=State sign route

County	Route	Description	Approximate mileage	Estimated cost
Santa Barbara	80 (SR 150)	San Marcos Pass Road—2.5 miles to 3.0 miles north of US 101; grade and surface (widening with some realignment)	0.5	$130,000
Santa Barbara	Various	Rights of way on state highway routes		1,400,000
Santa Clara	5 (SR 17)	In Los Gatos, connection from Route 5 Freeway to San Jose-Los Gatos Road; grade, surface and structures (cooperative project with Town of Los Gatos)	0.4	240,000
Santa Clara, San Mateo	68 (US 101 Bypass)	Bayshore Freeway—0.3 mile south of Willow Road to 0.1 mile south of Santa Clara county line; grade, surface and structures (extension of 6-lane freeway)	1.8	1,600,000
Santa Clara	113 (SR 9)	0.2 mile east of Laurence Station Road to 0.2 mile east of San Jose-Alviso Road; grade surface for initial two lanes of ultimate freeway	2.1	610,000
Santa Clara	114 (SR 9)	0.4 mile south of McClellan Road to El Camino Real; grade and surface (widening)	3.9	320,000
Santa Clara	Various	Rights of way on state highway routes		2,410,000
Santa Cruz	116 (SR 9)	Sidehill Viaduct (portions); structure		150,000
Santa Cruz	Various	Rights of way on state highway routes		300,000
Shasta	20 (US 299)	In Redding, 0.7 mile east of west city limits to Southern Pacific Overhead; grade and surface for 4 lanes	1.6	220,000
Shasta	Various	Rights of way on state highway routes		280,000
Sierra, Nevada	38 (US 40)	Near Floriston to Nevada state line; grade and surface for 4-lane expressway	5.4	2,600,000
Sierra	Various	Rights of way on state highway routes		36,000
Siskiyou	3 (US 99)	4.5 miles south of Yreka to Oberlin Road; grade and surface initial 2 lanes for ultimate 4-lane expressway	4.5	675,000
Siskiyou	46 (SR 96)	At Swillup Creek; bridge and approaches	0.1	55,000
Siskiyou	Various	Rights of way on state highway routes		616,000
Solano	Various	Rights of way on state highway routes		380,000
Sonoma	1 (US 101)	0.6 mile south of Wilfred Crossing to Santa Rosa; grade, pave and structures, extension of 4-lane freeway (13 miles now under construction)	5.0	2,900,000
Sonoma	1 (US 101)	At Mark West Creek; bridge and approaches		125,000
Sonoma	Various	Rights of way on state highway routes		540,000
Stanislaus	13 (SR 120)	2.1 miles east of Oakdale to 1.5 miles east of Orange Blossom Road; grade and surface (widening and some relocation)	3.8	400,000
Stanislaus	Various	Rights of way on state highway routes		2,000,000
Sutter	Various	Rights of way on state highway routes		300,000
Tehama	Various	Rights of way on state highway routes		30,000
Trinity	20 (US 299)	Weaverville to 1.8 miles east; grade and surface, widening, some realignment	1.8	230,000
Trinity	20 (US 299)	3.2 miles west to 0.2 mile east of Burnt Ranch Post Office (portions); base and surface	2.5	60,000
Trinity		Rights of way on state highway routes		20,000
Tulare	4 (US 99)	Visalia Airport Interchange to 1 mile north of Goshen; grade, pave and structures for 4-lane freeway	2.8	870,000
Tulare	4 (US 99)	0.5 mile south of Traver to Kings River; grade, pave and structures for 4-lane freeway (this project with the one above completes virtually continuous multilane divided highway from San Fernando to Fresno)	4.7	1,285,000
Tulare	4 (US 99)	Kings River to Clark Avenue; replace old Kings River Bridge	1.0	250,000
Tulare	135	Central Valley Highway—Sunrise City to 0.5 mile north of Deer Creek; grade and surface (widening and drainage correction)	2.7	230,000
Tulare	Various	Rights of way on state highway routes		110,000
Tuolumne	40 (SR 120)	South Fork Tuolumne River Bridge (Berkeley Camp); redeck bridge		15,000
Tuolumne	Various	Rights of way on state highway routes		20,000
Ventura	2 (US 101)	Ventura Freeway—Santa Clara Avenue-Rice Road Interchange; structure and approaches		205,000
Ventura	9 (SR 118)	At Santa Clara River near Saticoy, bridge and approaches	0.3	670,000
Ventura	9 (SR 118)	0.5 mile north of Santa Clara Avenue, southeast of Saticoy, drainage correction	0.2	40,000
Ventura	60 (US 101A)	0.3 mile south of Calleguas Creek to 0.1 mile southeast of Date Street in Oxnard; grade, pave and structures for 4-lane freeway	7.4	2,055,000
Ventura	Various	Rights of way on state highway routes		1,350,000
Yolo	Various	Rights of way on state highway routes		260,000
Yuba	3 (US 99E)	Olivehurst to Marysville; grade and surface for 4-lane expressway (structures now under contract)	4.0	1,200,000

SR=State sign route

will be extended from San Pablo to the beginning of the Carquinez Toll Bridge Project at Hercules; while on the same route in Placer County, the four-lane expressway through the Sierra Nevada foothills will be extended three miles westerly from Auburn and 12.6 miles easterly to Magra, about 6½ miles east of Colfax. Another 5.4 miles of four-lane expressway will be built on US 40 immediately west of the Nevada state line.

Construction of urban freeways will be begun or continued in the Cities of San Francisco, San Diego, San Bernardino, Riverside and Fresno.

For Right of Way

Among the budget allocations for acquisition of rights of way on major freeway routes are:

Alameda County—US 50 freeway in Oakland, $3,200,000; Route 226 (Webster Street Tube), $1,000,000.

Kern County—East-west freeway in Bakersfield $2,825,000.

Los Angeles County — Olympic Freeway, $11,000,000; Golden State Freeway, $13,000,000; Ventura Freeway, $6,000,000; San Diego Freeway, $2,740,000.

Sacramento County—South Sacramento Freeway, $800,000 (total now expended and budgeted $5,250,000).

. . . Continued on page 51

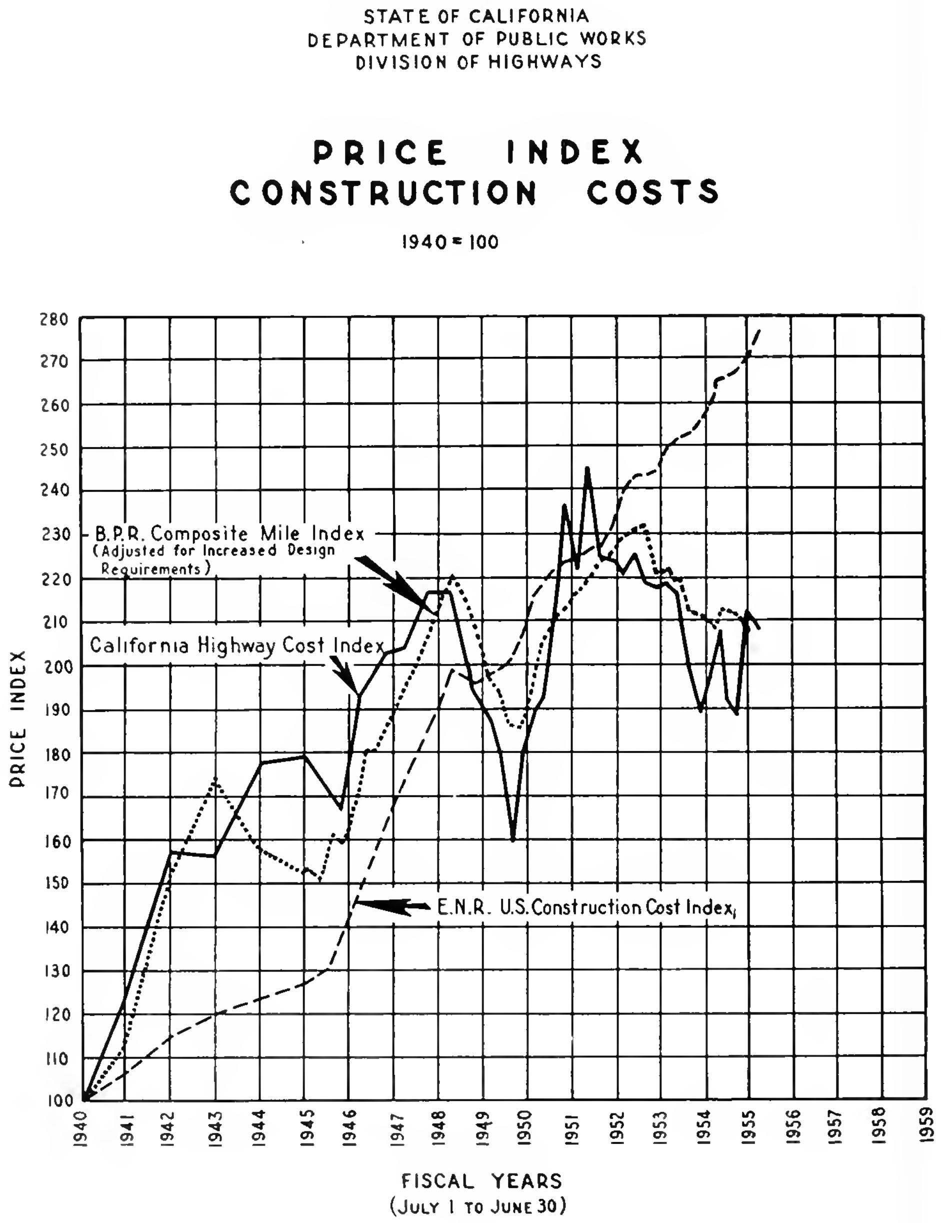
Cost Index

Almost Stationary During Third Quarter of 1955

By RICHARD H. WILSON, Assistant State Highway Engineer;
H. C. McCARTY, Office Engineer; and
JOHN D. GALLAGHER, Assistant Office Engineer

The 12.2 percent rise which occurred in the California Highway Construction Cost Index during the second quarter of 1955 did not continue into the third quarter of the year. On the basis of bids received during the third quarter the Index stood at 208.6 (1940=100) which is 1.8 percent lower than the 212.4 for the second quarter. Considering the height of the Index at the present this would indicate that the over-all highway construction costs were practically stationary during July, August and September.

As stated in our release on the California Highway Construction Cost Index in July it was the opinion of this department that the 12 percent upsurge during the second quarter of 1955 was the beginning of an upward trend in highway construction costs. This is still our opinion, as it is felt that the slight drop in the Index of 1.8 percent during the third quarter is the temporary result of some half dozen very large freeway projects involving unusually large quantities of concrete, bar reinforcing steel and structural steel. These freeway projects were all located in urban areas, close to sources of supply and distribution, resulting in favorable unit prices. Analysis of the smaller jobs presented a different picture. Unit bid prices on these jobs were definitely up. In many instances the bids exceeded the recently revised estimates by 3 or 4 percent, however, the weight of the quantities in the large freeway jobs was sufficient to result in a decrease on the Index.



It is still felt that competing bidders have reached the limit in devices for cutting prices and trimming profits and that bid prices must reflect the effects of rising labor and materials costs.

It is noted that the Engineering News-Record, reporting on the Associated General Contractors executive meeting in Minneapolis in its October 6 issue, stated that in the near future "there would be a steady surge toward a new record breaking volume of construction with exceedingly intense competition" and that, in addition, is the prospect of higher materials prices before February.

The accompanying tabulation shows the California Highway Construction Cost Index by years from 1940 through 1953 and by quarters for 1954 and 1955.

THE CALIFORNIA HIGHWAY CONSTRUCTION COST INDEX

Year	Cost Index
1940	100.0
1941	125.0
1942	157.5
1943	156.4
1944	177.8
1945	179.5
1946	179.7
1947	203.3
1948	216.6
1949	190.7
1950	176.7
(1st Quarter 1050—160.6)	
1951	210.8
(4th Quarter 1951—245.4)	
1952	224.5
1953	216.2
1954 (1st Quarter)	199.4
1954 (2d Quarter)	189.0
1954 (3d Quarter)	207.8
1954 (4th Quarter)	192.2
1955 (1st Quarter)	189.3
1955 (2d Quarter)	212.4
1955 (3d Quarter)	208.6

Inspection of the average unit prices bid during the third quarter of 1955 for the eight items upon which the California Index is based (see accompanying tabulation) shows a decline in bid prices for five items and an increase for two. As no bids were received for asphalt concrete pavement during the previous three quarters there was no firm comparison for the unit price of this item in the third quarter of 1955.

The average bid price during the quarter for roadway excavation dropped only 2 percent, from 42 cents to 41 cents per cubic yard. Untreated rock base showed the greatest rise, up 17 percent from an average price of $1.99 in the second quarter to $2.33 per ton in the third quarter; this is almost the same increase for this item as was made during the second quarter of 1955 when it rose 18 percent. Part of the increase in untreated rock base prices may be the result of recent labor difficulties in the sand, rock and gravel industry in Southern California.

Plant-mixed surfacing prices rose 1 percent during the third quarter from $5.39 to $5.43 per ton.

The average unit prices for the other four items all declined: portland cement concrete pavement down 7 percent, from $14.46 to $13.46 per cubic yard; structure concrete down 3 percent from $51.36 to $49.64 per cubic yard; bar reinforcing steel dropped 5 percent from $0.098 to $0.093 per pound; and structural steel was down 4 percent from $0.136 per pound in the second quarter to $0.132 in the third quarter.

As previously stated, the six large freeway projects which involved unusually large quantities of concrete and steel, located in city areas close to sources of supply and at favorable prices were responsible for the decreases in the average bid prices of these four items.

The accompanying chart, showing the California Highway Construction Cost Index, the Engineering News-Record Construction Cost Index and the United States Bureau of Public Roads Composite Mile Index compares the three, all reduced to the 1940=100 base.

The *Engineering News-Record* Index which comprises all types of construction is nation-wide in scope. For the third quarter of 1955 this index was up 2.3 percent from the second quarter of 1955.

The U. S. Bureau of Public Roads Composite Mile Index was down 1.6 percent in the second quarter of 1955 from the first quarter. Figures on this index are not as yet available for the third quarter of 1955.

The California Highway Construction Cost Index is by its very nature and limitations a sensitive tool and the changes which it shows from one quarter to another do not of themselves necessarily indicate trends. However, two or three quarters may definitely establish a trend. In the present instance it is believed that the 12 percent jump in the second quarter signaled a break in the more or less stationary status of the index and the 1.8 percent drop during the third quarter may prove to be only a point of hesitancy in a rising trend.

CALIFORNIA DIVISION OF HIGHWAYS AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Crusher run base, per ton	Plant mix surfacing, per ton	Asphalt concrete pavement, per ton	PCC pavement, per cu. yd.	PCC structures, per cu. yd.	Bar reinforcing steel, per lb.	Structural steel, per lb.
1940	$0.22	$1.54	$2.19	$2.97	$7.68	$18.33	$0.040	$0.083
1941	0.26	2.31	2.84	3.18	7.54	23.31	0.053	0.107
1942	0.35	2.81	4.02	4.16	9.62	29.48	0.073	0.103
1943	0.42	2.26	3.71	4.76	11.48	31.76	0.059	0.080
1944	0.50	2.45	4.10	4.50	10.46	31.99	0.054	0.132
1945	0.51	2.42	4.20	4.88	10.90	37.20	0.059	0.102
1946	0.41	2.45	4.00	4.68	9.48	37.38	0.060	0.099
1947	0.46	2.42	4.32	5.38	12.38	48.44	0.080	0.138
1948	0.55	2.43	4.30	5.38	13.04	49.86	0.092	0.126
1949	0.49	2.67	4.67	4.64	12.28	48.67	0.096	0.117
1950	0.40	2.25	4.26	3.75	11.11	43.45	0.079	0.094
1951	0.49	2.62	4.34	5.00	12.21	47.22	0.102	0.159
1952	0.56	2.99	5.00	4.38	13.42	48.08	0.098	0.150
1953	0.51	2.14*	5.31	4.58	12.74	50.59	0.093	0.133
1st Quarter 1954	0.45	2.28	4.23	4.78	14.89	47.52	0.092	0.126
2d Quarter 1954	0.38	2.09	4.29	5.18	14.28	47.12	0.093	0.114
3d Quarter 1954	0.43	1.85	4.68	7.00	12.63	49.59	0.095	0.162
4th Quarter 1954	0.35	1.78	4.83	--------	13.13	46.08	0.094	0.135
1st Quarter 1955	0.39	1.69	4.55	--------	13.44	40.66	0.095	0.140
2d Quarter 1955	0.42	1.99	5.39	--------	14.46	51.36	0.098	0.136
3d Quarter 1955	0.41	2.33	5.43	5.70	13.46	49.64	0.093	0.132

* Untreated rock base substituted for crusher run base at this point.

ABREAST OF HIGHWAYS

DEAR MR. ADAMS: *California Highways and Public Works* is so informative and pictorial that it keeps me abreast of the rapid progress and growth being made to our highway system, and the problems encountered therein.

You and your staff accept my congratulations.

Yours truly,

GILBERT S. BARKER
Inspector, Department of Water and Power
City of Los Angeles

Do People Like Freeways?

"THE TROUBLE with freeways in Los Angeles," wrote L. L. Wise, Associate Editor of *Engineering News-Record*, in a recent issue of that publication, "is that too many people use them.

"This statement, often seemingly made in jest, is actually a relatively good analysis of the current stage of development of the system of superhighways that crisscrosses downtown Los Angeles and extends out to suburban areas."

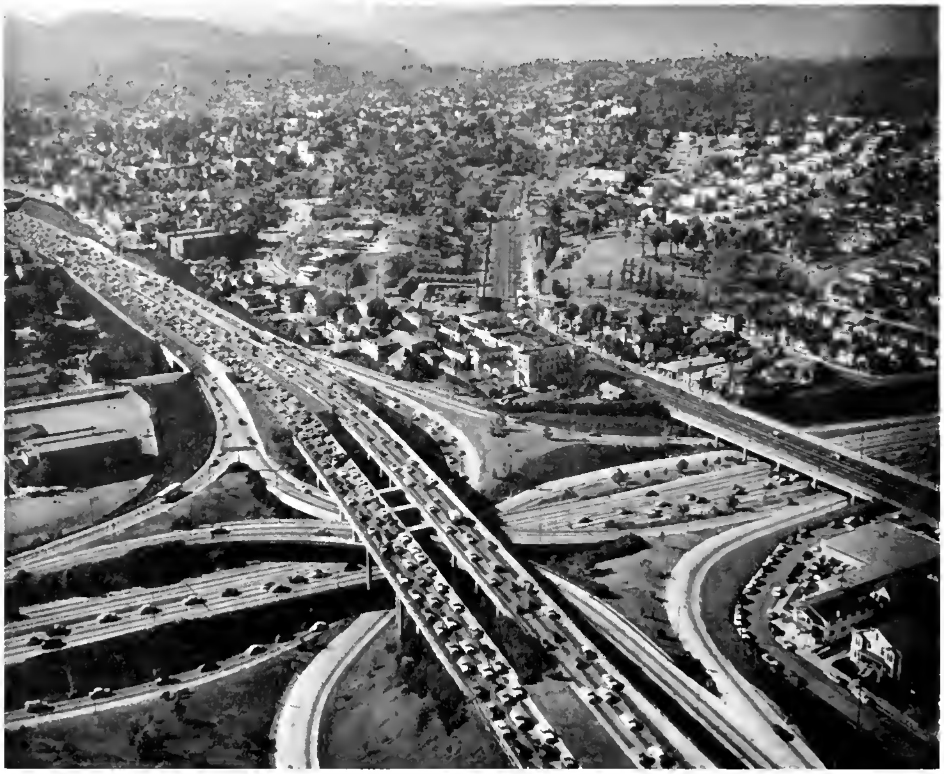
The aerial photographs on these two pages, taken during the afternoon rush hour on September 16, 1955, bear out Wise's statement. They show graphically how the vehicle-operating public has gravitated away from the main boulevards and onto the freeways.

The photographs bring to life the impressive statistics which have often been cited to substantiate the claim that the Hollywood Freeway is the most heavily traveled traffic artery in the world and the four-level interchange structure at the junction of the Hollywood-Santa Ana, Harbor, and Pasadena Freeways is the most heavily traveled intersection in the world.

Through the four-level interchange there pass, in a 24-hour period, well over a quarter of a million vehicles. One estimate has placed the daily traffic there on a heavy day at 281,500.

The Hollywood Freeway west of the four-level structure carries up to 180,000 vehicles a day on busy days. At certain peak hours, the traffic flow is in the vicinity of 8,000 vehicles per hour for four lanes in one direction.

Studies have shown that freeways draw traffic from parallel routes as much as two miles away. Why? Because people have discovered that freeways do the job they were designed to do: carry more traffic more safely and with less delay than the surface streets with their intersections at grade, their signals, and their unrestricted access from adjoining property.



Looking west toward Hollywood from the Four-Level Interchange structure, showing heavy traffic on the Hollywood Freeway and virtually none on famous Sunset Boulevard, which parallels the freeway

Paradoxically, this lure of the freeways has at times reduced traffic on once-congested parallel arteries to a mere trickle, as the photographs show. It is the freeway that appears congested. Yet motorists prefer the crowded freeway to the lightly traveled city street.

As it was summarized by Lloyd Aldrich, former city engineer of Los Angeles, in a recent study:

"Three times as much traffic can move on a freeway as on a parallel boulevard in half the time, at half the cost, and with one-fifth the fatal accident risk."

The State Highway Budget for the 1956-57 Fiscal Year contains approximately $73,000,000 for rights of way and construction on the metropolitan freeway system in the Los Angeles area.

In the foreseeable future, depending on the rate of financing, motorists will have their choice of a number of freeways passing through or around the central section. This integrated network of freeways will provide greater safety and freedom from congestion for the motoring public.

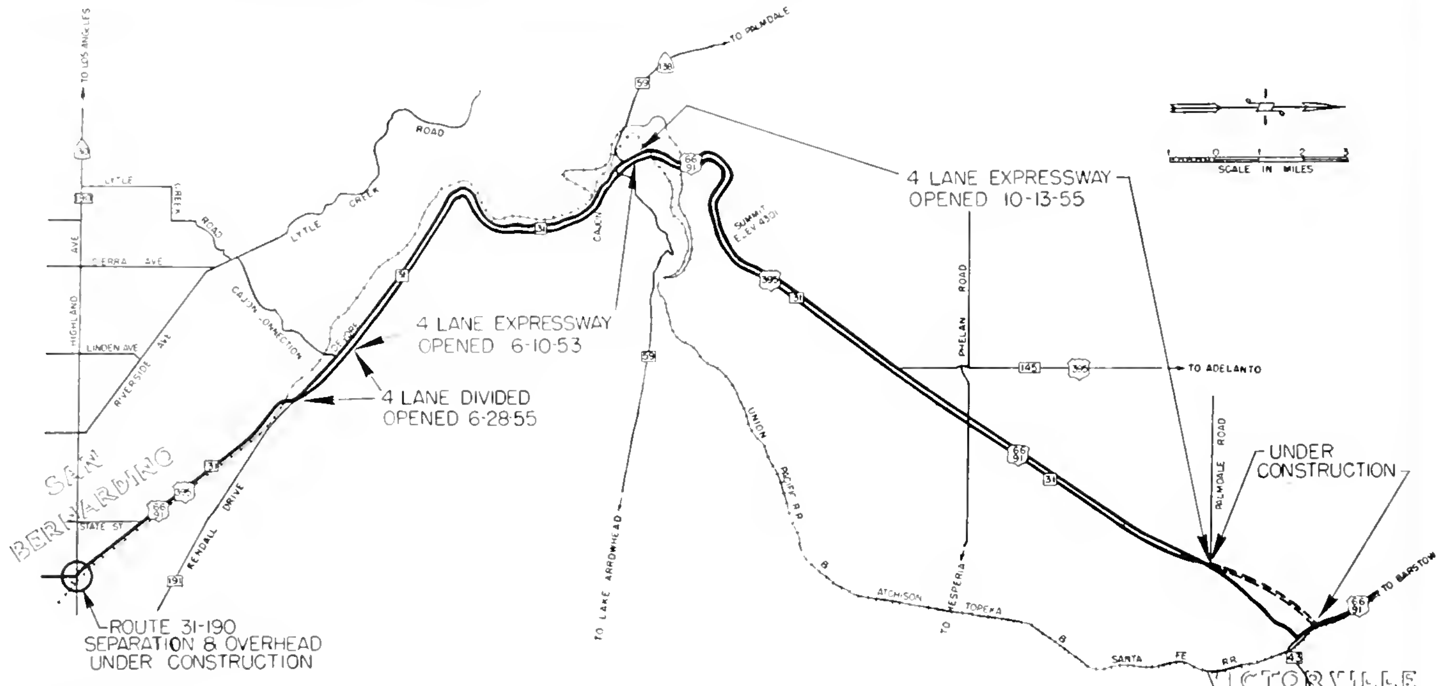
DRIVING NEAR PARKED CARS IS DANGEROUS

City driving has many dangers and not the least of these dangers is the danger of driving near parked cars.

Almost anywhere you drive on city streets, points out the National Automobile Club, you'll find these long lines of parked cars and driving near them you'll find that the unexpected can happen so suddenly and so close at hand that you rarely have time to avoid the consequences. Irresponsible drivers whip out from the curb right into your line of travel.

When driving near parked cars, be alert and avoid an accident.

Looking east toward Los Angeles Civic Center, showing heavy peak-hour traffic on the Hollywood-Santa Ana Freeway. The wide street to the right of the freeway is Temple Street, formerly a congested boulevard but now carrying very little traffic.



CAJON PASS

Continued from page 27 . . .

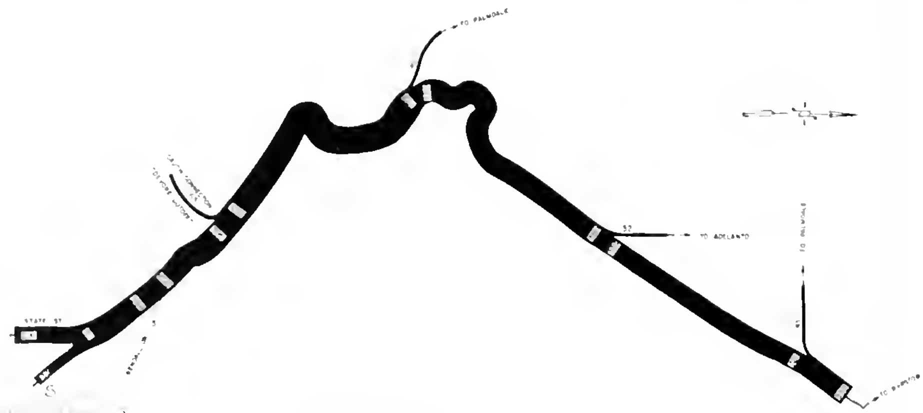
lished in the May-June, 1953, issue.* The photographs and sketches accompanying the present article bring up to date the most recent chapters in the history of US 66-91-395 between San Bernardino and Victorville.

Conversion to four-lane expressway of the section from Devore to Gish Underpass was completed on June 10, 1953, as indicated on the sketch. A southerly extension, including channelization of intersections at the "Devore Cutoff" and at Kendall Drive (US 66 Alternate), was completed on June 28, 1955. Channelization of the intersections proved to be a great benefit, resulting in much smoother and safer traffic flow. This extension was an "interim improvement," to provide safe and adequate traffic service during the years before further extension of the freeway can be financed. The freeway southerly from Devore will be located on new alignment, and is now in the design stage.

Traffic Flows

An indication of the traffic service provided by the Cajon Pass is given by the two traffic flow diagrams. These depict the average daily total traffic and also the volume of five-axle

1955 AVERAGE DAILY TRAFFIC



5 AXLE TRUCK COUNT
6 AM TO 10 PM JULY 18, 1955

* "Cajon Pass, Reconstruction of Historic Road from Trail to Expressway", by J. Dekema.

truck traffic, the most prevalent type of heavy commercial trucking. It is evident in the latter diagram that heavy trucks entering Cajon Pass from the southwest utilize State Street, a county primary road, as the main route. By so doing, the grade crossing of the Union Pacific and Santa Fe tracks on the "Devore Cutoff" is eliminated. The "Devore Cutoff" is also a county primary, and the grade crossing is closed by long and slow-moving freight trains for considerable periods every day. It is anticipated that a large amount of the truck traffic now using State Street will be diverted to the freeway as soon as it is completed to a junction with the San Bernardino Freeway (US 70-99) in Colton.

Additional Work

Additional work is under way on the southern approaches to Cajon Pass, where a $785,000 contract was awarded to R. M. Price Company on October 7, 1955, for construction of the Highland Avenue Separation and Railroad Overhead. This will later become an integral part of the freeway for US 91-395 through the City of San Bernardino, on which construction has commenced.

Northerly of the Griffith Company project which has just been completed, the US 66 "Victorville Bypass" is well along toward completion. This consists of a 3.8-mile section on new alignment between Palmdale Road and "D" Street, in the westerly portion of Victorville. It is being constructed by Norman I. Fadel, Inc., Altfillisch Construction Company, and Bert C. Altfillisch. Work on this $716,000 job started April 28, 1955, and is about 70 percent complete. J. Fadel is superintendent for the contractor, and Tom Borman is resident engineer for the State Division of Highways.

Further extension of the "bypass" northward toward Barstow was provided on October 20, 1955, by the California Highway Commission allotment of $1,500,000 for the Victorville Overhead and Mojave River Bridge and approaches in the budget for the 1956-57 Fiscal Year.

PLACER COUNTY BRIDGE

Continued from page 21 . . .

Auburn Dam, the controlling grade and alignment features of the entire route and the dollars and cents savings per vehicle crossing. Upon the basis of these considerations it was determined that a $275,00 project would amortize itself in approximately 15 years by actual savings in time and distance traveled. On this basis the new structure was designed on a 265-foot radius horizontal curve with 8 percent superelevation and a vertically curved grade line. Ample width for two vehicular lanes is provided by a 28-foot roadway with a four-foot pedestrian sidewalk on the downstream side. The necessity to provide for a secondary county road approach at the east end of the structure complicated the design considerably. Eddying currents caused by the confluence of the north and middle forks immediately downstream dictated the use of approach embankment protection. The entire project was designed with a freeboard of three feet above the 1950 flood plane. The length of the bridge, 340 feet, together with approaches, made a project 0.44 mile in length.

Controct Awarded in 1954

The project was advertised for bids over date of July 9, 1954, and bids were received August 4, 1954; James B. Allen of San Carlos being the successful bidder. The contract was awarded August 13, 1954, and approved September 8, 1954, allowing 200 working days for the completion of the work.

The early stages of construction developed into a race with nature to complete footings, abutments, and pedestal columns to a point above normal high water anticipated in the rainy season. However, normal high water did not develop during that season even though the contractor had his work in the clear. Construction progressed at a steady pace, the only major changes consisting of reduction in the excavation for footings and the addition of a heavy rock riprap foundation for the sacked concrete embankment protection. The bridge and approaches were opened to traffic on July 29, 1955. The remaining incidental work was accepted as complete on August 29, 1955.

An indication as to how closely the original estimate of cost was adhered to is as follows:

	Original estimate	Final cost
Contract items	$198,146.00	$198,954.38
Supplemental work	3,518.00	15,650.30
Contingencies	10,083.20	
Subtotals	$211,747.20	$214,604.68
Construction engineering	$19,814.60	$19,258.25
Preliminary engineering performed by State	$11,000.00	$7,837.84
Preliminary engineering Performed by county	5,600.00	$5,24.16
Totals	$248,161.80	$246,944.93

Financing of the project was accomplished with 2½ fiscal years' allotment of federal-aid secondary highway funds totaling $135,000 plus matching funds consisting of state highway funds in the amount of $78,388 and county funds in the amount of $33,056.93.

The county gives credit for the success of the project to the close cooperation of the county engineering staff with that of the U. S. Bureau of Public Roads and the California Division of Highways. On the part of the county, special commendation goes to E. C. Whiting, resident engineer; Clayton R. Taylor, inspector; and Norman Andregg for preliminary approach plans. In the Division of Highways, the county is grateful to Ted Jain of District III, now retired, and W. C. Kiedaisch of the Bridge Department. Expeditious preparation of plans by the Bridge Department saved an entire year in opening the project to traffic.

MAMMOTH SUGAR PINE

A mammoth sugar pine tree is located off Oregon Highway 62 on the way to Crater Lake National Park. The tree is 224 feet high, 500 years old, 7 feet 11 inches in diameter, and contains 29,000 board feet.

Retirements *from* Service

R. M. Gillis

Deputy State Highway Engineer Ridgway M. Gillis retired on November 1, 1955, after 26 years of service with the California Division of Highways.

On the eve of his retirement, Mr. and Mrs. Gillis were guests of honor at a dinner attended by 250 friends and associates.

Most of Gillis' career with the State has been in positions of broad responsibility for the carrying out of a statewide highway construction program which has increased tenfold during the past quarter century.

Gillis was born in Oakland in 1885, and was graduated from Whitman College in 1906 with an A.B. degree. He received his B.S. degree in civil engineering from the Massachusetts Institute of Technology in 1910.

After various engineering jobs which included service with the Northern Pacific Railroad, Gillis joined the Washington State Highway Department in 1912. He remained there until 1926, resigning to accept a position with the Pacific Bridge Company.

Joins Division of Highways

In April, 1929, he came to work for the California Division of Highways as construction engineer in District X, covering the northern San Joaquin Valley and Mother Lode regions. Later the same year he became assistant construction engineer for the division, working out of Sacramento Headquarters and inspecting highway projects in every corner of the State.

He was promoted in 1933 to district engineer of District VI, with headquarters at Fresno, where for five years he was in charge of state highway planning, construction and maintenance in the central and southern San Joaquin Valley counties.

In 1938 Gillis returned to Sacramento as construction engineer for the Division of Highways. He was a strong early advocate of cement treated base construction. California still leads the Nation in the use of this method of stretching the highway dollar by adding a small percentage of cement to available local base materials, thereby reducing the total thickness of base and pavement required to support traffic.

When the division was reorganized in 1947 to meet the expanded construction program under the Collier-Burns Act, Gillis was promoted to assistant state highway engineer in charge of operations, which includes supervision of these four departments: Construction, Maintenance, Equipment, and Materials and Research.

Named Deputy Highway Engineer

In July, 1950, Gillis became Deputy State Highway Engineer upon the retirement of Fred J. Grumm. In this capacity he has worked directly under State Highway Engineer G. T. McCoy in administering a highway program which this year involves total expenditures for state highway purposes of about $290,000,000.

Gillis was elected to membership in the American Society of Civil Engineers in 1916. He is a life member of the society, and past president of its Sacramento section. He has served as the Division of Highways representative on the Advisory Committee of the Institute of Transportation and Traffic Engineering of the University of California.

Gillis and his wife, Marjorie, live at 3650 West Lincoln Avenue, Sacramento. They have three sons, Lyman R. Gillis of San Mateo, an assistant district engineer with the Division of Highways; Jackson C. Gillis of Los Angeles; and William M. Gillis of Orinda.

Deputy State Highway Engineer Ridgway M. Gillis, Retired

Earl T. Scott

Earl T. Scott, District Engineer of District VI of the State Division of Highways with headquarters at Fresno, retired from state service on November 1st.

Scott was with the division 41 years and had been district engineer at Fresno since 1938. The territory under Scott's direct supervision included Fresno, Madera, Kings, Tulare and Kern Counties. An estimated $60,000,000 worth of construction has been completed along state highways in his area since he took over as district engineer 17 years ago.

Scott had charge of much of the major construction work which converted the San Joaquin Valley section of US 99 into multilane, divided highway. When jobs now under way or budgeted are completed, only 10 miles of the total 189-mile length within his district will remain to be financed and constructed as divided roadway. A great deal of planning work has also been accomplished by Scott's staff, looking toward further improvement of much of the completed multilane mileage to full freeway standards. Scott came to work for the division in 1914 as an assistant resident engineer in the Los Angeles district and then as superintendent of construction on work along the Old Ridge Route between Bakersfield and Los Angeles.

During World War I he served overseas as a 1st lieutenant in the 23d Engineers, U. S. Army, and returned to state service in 1919.

He was with the U. S. Bureau of Public Roads for a short time during 1921 and 1922, but returned to the division to accept a post in the maintenance department of the Los Angeles office.

He was later promoted to district maintenance engineer, the position he held in 1938 when he was appointed to take over as district engineer of District VI.

Scott was born in Tacoma, Washington, and came to California in 1892. He attended elementary and high schools in Los Angeles and graduated

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RETIREMENT PARTY PHOTO. At lower left corner is Mrs. Thomas A. Scott, Mr. Scott's daughter-in-law; Otto C. Soennichsen; Chief Clerk Walter P. Kelso; E. T. Scott, and C. F. Waite.

W. P. Kelso

W. P. "Walt" Kelso, Chief Clerk for the Division of Highways, District VI in Fresno, retired on November 1, 1955, ending a 24-year career with the State.

All of Kelso's service was with District VI where he started work as a bookkeeper in February, 1931. He was promoted to chief clerk in 1944.

Kelso was born in Brooklyn, New York. He served with Company K, 106th Infantry, during World War I and was wounded in action in Belgium in August, 1918, for which he was awarded a Purple Heart.

After discharge from military service he attended New York University, graduating with a degree in accounting in 1923. He came to California in the fall of the same year and worked as an accountant for several private firms in the San Francisco Bay area before he came to work for the State.

Kelso and his wife live at 1500 Roosevelt Avenue in Fresno. They have one son who is a pilot in the U. S. Air Force.

William L. Welch Succeeds Earl Scott in Fresno

Appointment of William L. Welch as District Engineer of District VI of the State Division of Highways, to succeed Earl T. Scott who retired November 1st, was announced by State Highway Engineer G. T. McCoy.

WILLIAM L. WELCH

District VI, with headquarters at Fresno, comprises 1,609 miles of state highways in Madera, Fresno, Tulare, Kings, and Kern Counties.

Welch has for the past five years served as chief assistant to the Engineer of Design in the division's Headquarters Office in Sacramento. He has been an engineer with the Division of Highways since 1929.

Native of New York

A native of Newburgh, N. Y., Welch was educated in Iowa and Nebraska, and studied civil engineering at the University of Nebraska.

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William L. Fahey

William L. Fahey, district engineer in charge of construction, maintenance, and administration for District VII of the State Division of Highways, retired December 1, 1955, bringing to a close a notable engineering career of 27 years service with the State of California. District VII comprises the three Counties of Ventura, Orange, and Los Angeles where much of the state highway work being done is in the development of a freeway system for the Los Angeles metropolitan area, which is fast becoming recognized as comprising just about all of the three counties of the district.

WILLIAM L. FAHEY

Bill was born in Lyons, Iowa, and received his early education in the grade and high schools of that city. He received his university education at the Iowa State College of Agriculture and Mechanics Arts at Ames, where he received his bachelor of science degree in civil engineering in 1914. It will be recalled that this college has maintained the Iowa Engineering Experimental Station that has contributed so much to basic engineering knowledge concerning highway construction and operation. Among this college's distinguished alumni is Thomas H. MacDonald, who was U. S. Commissioner of Public Roads for many years, and recently retired.

Worked in Iowa

Bill's first engineering position was inspector and resident engineer for the Iowa Engineering Company. He then worked as assistant city engineer of the City of Clinton, Iowa. Following these assignments he worked for the Iowa State Highway Commission as a bridge construction engineer and later as assistant county engineer and county engineer for Clay County, Iowa. Then came World War I in which he served the Army as a 2d lieutenant. At the close of the war, Bill resumed civilian life by engaging in private practice as a civil engineer and also doing city engineering work, until 1928 when he came to California, accepting a position as engineering draftsman in the Los Angeles district office.

Fahey rapidly advanced in state service through the positions of assistant resident engineer, resident engineer, becoming assistant district maintenance engineer on September 1, 1936. Bill was promoted on March 28, 1938, to fill the position of District VII maintenance engineer, which position he held until November 1, 1948, when he became district engineer. This position in which he has responsibilities for the functions of highway construction, maintenance and administration in District VII he held until his retirement. This has been an important period in state highway history because, with the Collier-Burns Highway Act of 1947 going into effect, increased financing has greatly stimulated freeway construction particularly in District VII.

Fine Record

While Bill has been the administrative head of the District VII Construction Department, over 150 miles of multiple freeways and expressways have been completed in this district at a total cost of some $350,000,000. As administrative head of the district maintenance department he has had responsibility for taking care of the 1,417 miles of the State Highway System in District VII. The work of the district has been steadily mounting. In 1948 there were 688 employees on the staff pay roll, while in 1955 the number is 1,464.

Bill's many friends and associates within and outside state service gathered to do him honor at a retirement dinner party held at the Rodger

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Langsner to Succeed Fahey

George Langsner, Assistant District Engineer, Programs and Budgets for District VII, was promoted to fill the position vacated by District Engineer W. L. Fahey.

Langsner started work for the Division of Highways on a survey party after graduation from California Institute of Technology in 1931.

GEORGE LANGSNER

He was principal assistant resident engineer on the construction of the Arroyo Seco Parkway, now the Pasadena Freeway, and resident engineer and utility coordinator on the Terminal Island Freeway construction. His experience also includes four years of right of way work.

Langsner became district utility engineer in 1947 and was promoted to assistant district engineer, design, in 1949, In that capacity he was responsible for the design of many of the metropolitan freeways in the downtown Los Angeles area. He was assigned to program and budget duties in 1954.

Born in Brooklyn, New York, Langsner attended grade school there and high school in Ontario, California.

He is a member of the American Society of Civil Engineers, the American Right of Way Association, the Highway Research Board and the engineering honor fraternity Sigma Xi. He also has served as editor of the *Cal Tech Alumni Review* and is past director and Vice President of the Cal Tech Alumni Association.

Langsner, who lives at 101 Pamela Road in Arcadia, is married and has a son and a daughter.

A. I. "Irv" Rivett

A. I. "Irv" Rivett, Safety Engineer for the Division of Highways, retired on October 7, 1955, bringing to an end 40 years of service with the State. The past 17 years of his career were in safety work. The present-day employee safety program now in operation throughout the 11 highway districts in the State was developed largely by Rivett.

In 1938, he was called in as assistant engineer in the newly-formed Safety Department, forerunner of the present Traffic Department. For the next few

A. I. RIVETT

years he toured the State lecturing before civic and school groups on the engineering aspects of highway safety and accident prevention. Rivett was one of the first men in the country to mount a movie camera in the windshield of his car so that he could catch candid shots of traffic violators in action as he traveled over the state highways going to or from his assignments. He used some of this film to illustrate points in his lectures.

Employee Safety Program

It was shortly after coming to work in the Safety Department that Rivett began to realize the need for an employee safety program within the Division of Highways itself. During the next few years he initiated and developed such a program with the result that in 1945 he became Safety Engineer for the division, devoting himself 100 percent to employee safety.

In 1950, full-time safety supervisors were appointed for each of the 11 highway districts in the State, and for Headquarters departments with large field or shop forces putting into effect one of the first over-all employee safety programs among highway departments in the Country.

Under Rivett's direction, these men, along with assistant safety engineers working out of the headquarters office in Sacramento, travel through their districts and the state supervising employee safety programs, inspecting shops and yards and visiting maintenance and other field crews on the job, on the alert for unsafe equipment or work practices that might mean loss of life or limb to one of their fellow employees.

Rivett and his crew have used many methods in addition to the inspection tours to get their message over to the 11,000 employees in the division. Posters, lectures, movies, filmstrips and reaction tests all play their part.

Accident Frequency Drops

Since 1940, when the employee safety program started, the accident frequency among division personnel has dropped to well below half of what it was 15 years ago.

An additional responsibility assigned to Rivett since 1951 has been the coordination of the employee suggestion system for the Division of Highways. In the past four years he has processed about 1,650 suggestions submitted by state employees to the State Merit Award Board.

A man of broad interests, Rivett has an impressive list of "firsts" to his name. He is a charter member and past state vice president of C. S. E. A. and one of the founders and past president of the State Employees Credit Union. He is a charter member of the Valley Chapter of the American Society of Safety Engineers,

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A. L. Anderson

District XI of the State Division of Highways is losing the services of one of its most loyal and conscientious employees in the person of A. L. "Andy" Anderson who has announced his retirement on December 1, 1955, after 36 years with the State Division of Highways.

A. L. ANDERSON

Andy was born January 15, 1894, in LaMont, Illinois, where his early boyhood was spent. Then as now, however, California's golden gleam could not be denied and Fresno's school bells were soon beckoning him to class. In preparation for his future career, he specialized in several business schools, after his ties were severed with the local high school. In 1913 he decided to try the life of a rancher, but this was interrupted in 1915 when he answered his country's call and entered the U. S. Navy as a yeoman, serving throughout World War I.

November 17, 1919, began his employment with Highways as an assistant clerk in his home town of Fresno, the headquarters for District VI. Less than two years later he had risen to chief clerk of the district, continuing to occupy that important position until September 1, 1933. At this time, E. E. Wallace, now retired, District Engineer of District VI was transferred to the fledgling District XI as District Engineer, and gathering the best of District VI including Chief Clerk Andy, moved bag and baggage to San Diego.

During his long career with Highways, Andy has seen many improvements in accounting techniques placed into effect as our division has grown and grown, no few of which are his own ideas now become policy. He is a charter member of the C. S. E. A. and served as the first secretary of the Fresno Chapter. His interest in employee welfare and efficient operation has remained uppermost in his mind,

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A. I. RIVETT

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charter member and past president of the State Men's Club and one of the organizers of the State Men's Speakers Club. He is also a charter member of the Public Relations Round Table of Sacramento.

Native of Sacramento

He also served as editor of the *State Employee*, the official publication of the C. S. E. A., and was the first to issue the paper in tabloid form, its present format. He also served on the Committee on Safety of Maintenance Personnel of the National Highway Research Board.

A native Sacramentan, Rivett attended grade and high school in Sacramento. His first job with the California Highway Commission, forerunner of the Division of Highways, was in 1912 as a draftsman with the District III office, then located in Sacramento. For the next 11 years his state service was interrupted with time out for engineering studies at the University of Nevada and two periods of service with private electrical concerns. In 1923 he became an engineer in the Division of Water Resources.

Six years later he returned to the Division of Highways to accept an appointment as assistant maintenance engineer for District X, whose headquarters at that time also were in Sacramento. In 1933 he moved to Stockton when the District X offices were transferred there. He returned to Sacramento in 1938 when he was appointed assistant engineer in the newly created Safety Department.

Rivett and his wife, Ora, live at 2722 Fifth Avenue in Sacramento. They have two sons, Donald, a placement officer with the California Youth Authority, and Dexter, with the public relations section of the McClatchy Newspapers; a daughter, Leora, and six grandchildren.

MOTOR VEHICLE REGISTRATIONS

Motor vehicle registrations are expected to reach 61 million in the United States for 1955. Passenger cars will comprise almost 51 million of the total.

A. L. ANDERSON

Continued from page 45 . . .

and he leaves to his successor undoubtedly the best organized department in the State. He and his wife, Frances, have their home at 4630 Norma Drive, San Diego, and plan after extensive traveling to just rest and pursue the elusive fish, and cheer the local baseball team to victory. Lately the shutterbug has bitten him and he is in the throes of gathering color pictures of all and sundry. And just to keep from getting old, he has admitted that he may return to one of his earliest loves, bowling. Return, that is, if he has time. Our best wishes are extended to an exemplary employee and an unsurpassed department head as he enters retirement, A. L. Anderson.

EARL T. SCOTT

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from Stanford University in 1914 with a degree in engineering.

Scott is a member of the California Society of Professional Engineers, past president of the Fresno Engineers Club, past commander of the American Legion's 23d Engineers Post 345 and a member of the Transportation and Highway Committee of the San Joaquin Valley Council, State Chamber of Commerce.

He also served as chief of engineering services for Region 6 of the California Office of Civil Defense.

Scott's home is at 872 Peralta Way in Fresno. He has two sons, Thomas, also of Fresno, and Robert, of Menlo Park, and three grandchildren.

WILLIAM L. FAHEY

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Young Auditorium in Los Angeles on the evening of December 2, 1955.

Mr. and Mrs. William L. Fahey at the present time live at 8056 Langdon Avenue, Van Nuys, in the San Fernando Valley. Their plans after retirement include the development of 10 acres of hilly and canyon land in the City of Oceanside, California, where they expect to make their future home.

WELCH SUCCEEDS SCOTT

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After a few years of engineering work on railroads and highways in that state, he came to California in September, 1929, and joined the staff of District I, Division of Highways at Eureka, as a draftsman.

In 1933 Welch moved to Los Angeles, where he first served as resident engineer on construction jobs. During the next nine years he worked on highway design, specifications and estimates, planning, and administration, most of the time in District VII (Los Angeles, Orange and Ventura Counties) and part of the time in Sacramento headquarters office.

During World War II Welch served three and a half years with the U. S. Marine Corps. For most of that time he was the operation officer of an engineering battalion, serving on Guadalcanal and in other Pacific combat areas. He held the rank of Major at the time of his relief from active duty.

In Charge of Traffic Surveys

For two years after his return to the Division of Highways, he was in charge of the origin and destination surveys of traffic which served as a basis for metropolitan freeway planning in the San Francisco Bay area. He then returned to the Los Angeles area to take charge of materials investigation survey and design for freeways and other state highways there.

In November, 1949, Welch was assigned to the division's Headquarters Design Department. While serving as administrative assistant to the Engineer of Design, his responsibilities have included development of California's recognized outstanding highway designs, and final design review of construction plans for the state's expanded program of metropolitan area freeway development and other highway improvements.

Welch is married and has two grown sons, William R., living in Sacramento, and Richard J., San Francisco.

Twenty years from now the American consumer will be using 60 percent more oil than he uses today, according to the National Automobile Club.

Dave Langford

Dave Langford, Highway Chief Clerk I, District V, San Luis Obispo, retired on December 31, 1955, after 35 years of notable state service.

Dave was employed by the State on May 7, 1921, as a clerk and since 1923 has been continuously in charge of the District V accounting office, advancing steadily through many grades to his present position.

DAVE LANGFORD

Born at Milton, California in 1893, Dave was graduated from Stockton Commercial College in 1912. He worked as an accountant for the Sterling Iron Works in Stockton until the outbreak of World War I when he enlisted in the United States Navy, serving two years, chiefly in Scotland and France. He was discharged as pharmacist mate first class. He then was employed by the Shell Oil Company, Stockton, and E. C. Loomis and Son, Arroyo Grande, before entering state service.

Dave has been very active in affairs of the California State Employees' Association, serving in a number of Chapter 10 offices, including president in 1939 and delegate to the General Council several times, where, in 1937, he was elected treasurer and thereafter a member of the Board of Directors of the CSEA headquarters organization.

An ardent sportsman, Dave expects to devote his energies to hunting and fishing throughout the West. His leisure will be spent at his home, 652 Mitchell Drive, San Luis Obispo, and visiting his son and twin granddaughters in Santa Barbara.

REWARD FOR KIT CARSON

Kit Carson's former employer offered a 1-cent reward for the return of 16-year-old Kit when, according to the National Automobile Club, he ran away from Missouri to become a fur trader and guide in New Mexico.

DEPUTY STATE HIGHWAY ENGINEERS NAMED

Appointment of J. W. Vickrey and Charles E. Waite as Deputy State Highway Engineers for the California Division of Highways was announced on November 17th by State Highway Engineer G. T. McCoy.

The appointments were made retroactive to November 3, 1955, two

J. W. VICKREY

days after the retirement of Ridgway M. Gillis, who had been Deputy State Highway Engineer since 1950.

Because of the increased workload which has developed in California's accelerated state highway program, McCoy said, two deputies were being appointed to provide the "additional top level administrative assistance required to handle the increasing program."

In this first reorganization since 1947 of the top management structure of the Division of Highways, Vickrey was designated as Deputy State Highway Engineer—Engineering and Waite as Deputy State Highway Engineer—Administration and Management.

Both men have been serving as Assistant State Highway Engineers, and were selected for promotion from a recently established civil service list.

J. C. Womack, Planning Engineer for the State Division of Highways since 1948, was named to the position of Assistant State Highway Engineer—Planning. He will fill the position formerly held by Vickrey.

Assistant Planning Engineer John A. Legarra has been promoted to the

CHARLES E. WAITE

Planning Engineer post formerly held by Womack.

Along with these changes, McCoy announced the assignment of personnel and public relations functions for the Division of Highways to J. P.

J. C. WOMACK

J. A. LEGARRA

Murphy, principal highway engineer who has been in charge of public relations. The new duties which Murphy is assuming were formerly carried out by Waite.

Shasta County Project Now Is Completed

The contract for the four-lane divided highway from Mountain Gate to Bass Hill in Shasta County has been completed. This is the culmination of construction begun in 1953 to improve the highway from Redding to Shasta Lake.

The first contract let in that year covered the grading from Boulder Creek to Project City. Fredrickson & Watson Company completed the work at a bid price of $555,555.55.

The next spring, a contract was awarded to Rice Bros., which covered paving for this grading contract and extended the grading and paving to the foot of Sulphur Creek Hill in Redding. This work was performed under a bid of $579,390.

Later in the year, a contract was awarded to Fredrickson & Watson Company for grading and paving from Project City to Mountain Gate for $686,680.

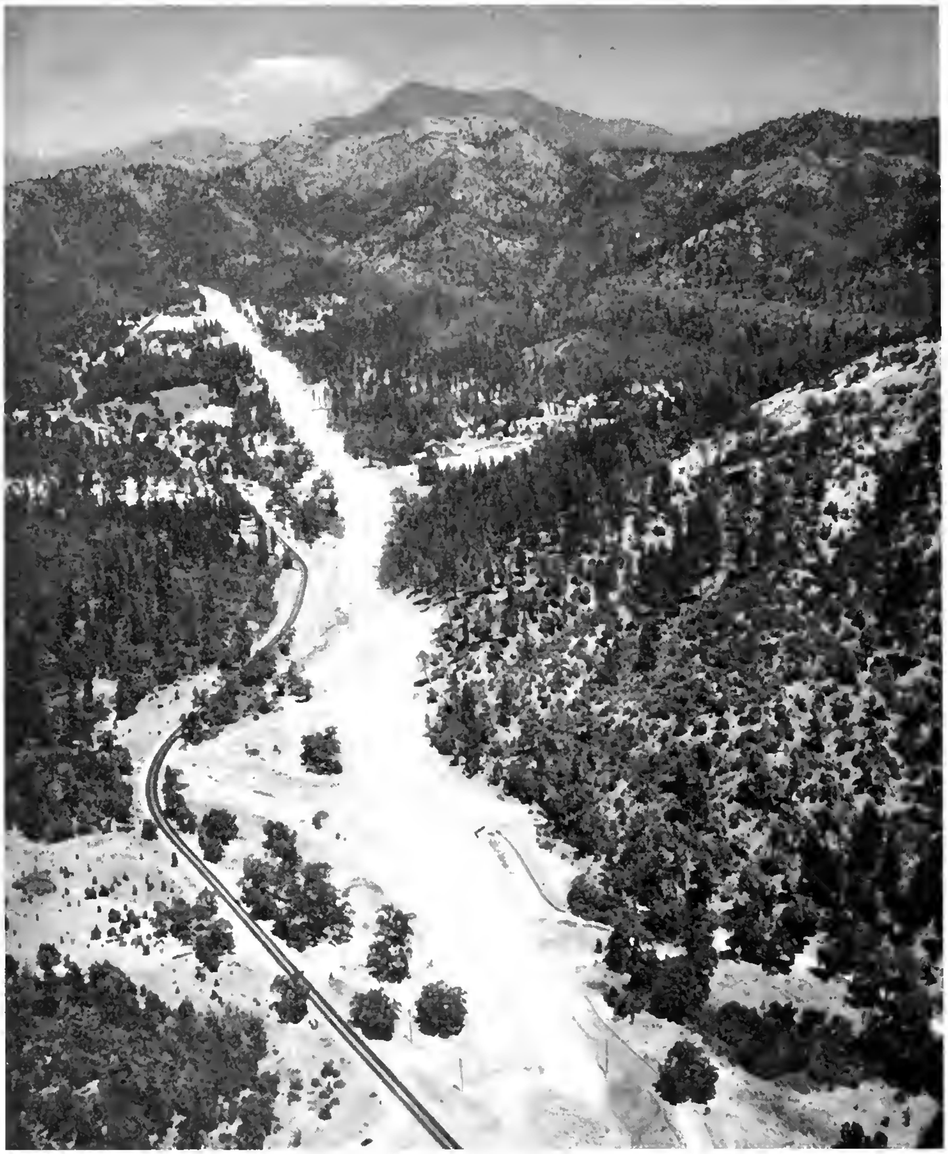
Expenditures $2,607,181

Just before the first of 1955, another contract was awarded to Fredrickson & Watson Company for grading and paving from Mountain Gate to Bass Hill for $785,555.55. This is the contract just completed.

The expenditures on these sections and their lengths are:

Fredrickson & Watson Co. (included in Rice contract)		$555,555.55
Rice Bros.	5.2 miles	579,390.00
Fredrickson & Watson Co.	3.7 miles	686,680.00
Fredrickson & Watson Co.	2.9 miles	785,555.55
Totals	11.8 miles	$2,607,181.10

The first thing that impresses the driver on the new highway is the scarcity of traffic. After being accustomed to driving on the old highway which was crooked, narrow, and frequently loaded to capacity, he gets on the new one and feels like asking "where did everybody go?" Well, all the traffic which was on the old highway is present plus an additional small percentage. When traffic from the old highway was turned into a new facility capable of comfortably handling at least four times as many vehicles as the old one, they did not appear to be nearly as numerous.



Looking northerly along new alignment towards Bass Hill from Mountain Gate. This photo taken during construction shows old highway on left.

Sacramento Canyon Project

J. W. Trask, District Engineer of the Division of Highways at Redding, says this 11.8-mile improvement might well be considered the start of the Sacramento Canyon's improvement. While its location is not definitely in the canyon, it would have been very poor policy to start construction in the real canyon north of Shasta Lake and leave this bottleneck between Redding and the relocated highway around Shasta Lake.

As the status of construction stands, right now the highway between Redding and Shasta Lake has been improved to current standards. The road around Shasta Lake, relocated when the dam was built, while not up to current standards, will provide service at least until the improvements in the canyon are completed.

North of this section, there are now underway two grading contracts and the Dog Creek Bridge contract. The aggregate cost of these will be about $3,000,000.

There still remains about 21 miles to be relocated and constructed beyond the end of the current construction and the new Sacramento River bridge in North Dunsmuir.

Traffic Lines

Marking Equipment Specially Built by Highways Division

By EARL E. SORENSON, Equipment Engineer

RAILWAY TRAINS, operated by skilled crews, require steel rails and flanged wheels to control them, keep them in their paths of travel, prevent collision, and guide them to their destination. Highway traffic depends on painted lines and the eccentricities of drivers of varying skill.

Each highway unit is of very small tonnage in comparison to that of a railway unit. However, there are many thousands of cars and trucks operated, for each train, and each one has lethal possibilities if not properly handled and controlled.

No doubt most of you have wondered what lies behind the signs and the familiar stripes that are painted on our highways and which flow smoothly for thousands of miles to direct you in the proper travel paths. Striping a modern complex highway requires the utilization of the most modern technique on the part of today's traffic engineers, for stripes must not only be designed and positioned to make manipulation of vehicles natural and easy, but they must be designed to convey control messages in a manner so simple that even the poorly informed driver can understand and follow them.

Concepts of Traffic Control

The latest concepts of traffic control, through stripes and signs, as conceived by the traffic engineers, would be of little value without the modern equipment and machinery to place them in effect. The striping of our highways has become a major operation, and requires this specially-built equipment and machinery to accomplish the desired results without excessive cost.

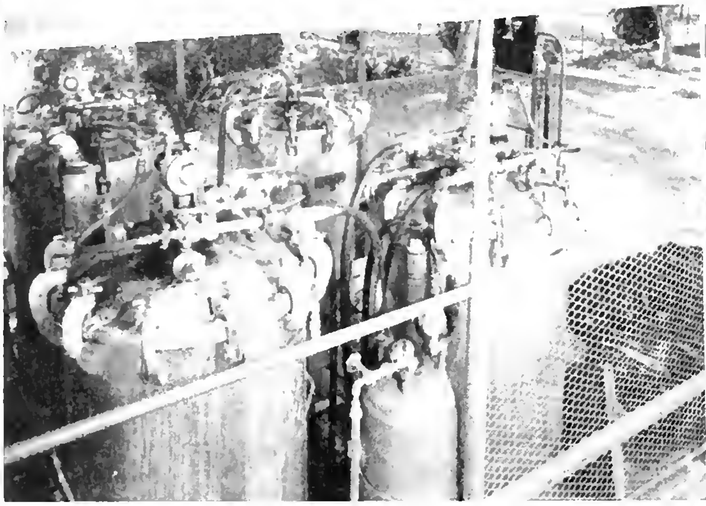
The Equipment Department of the California Division of Highways has pioneered in the development of modern, fast, economical highway marking machines. Approximately 30 other states have built markers following, to a large degree, the Equipment Department's design. Plans have also been requested by several South American countries, as well as some of the states and territories in the Commonwealth of Australia.

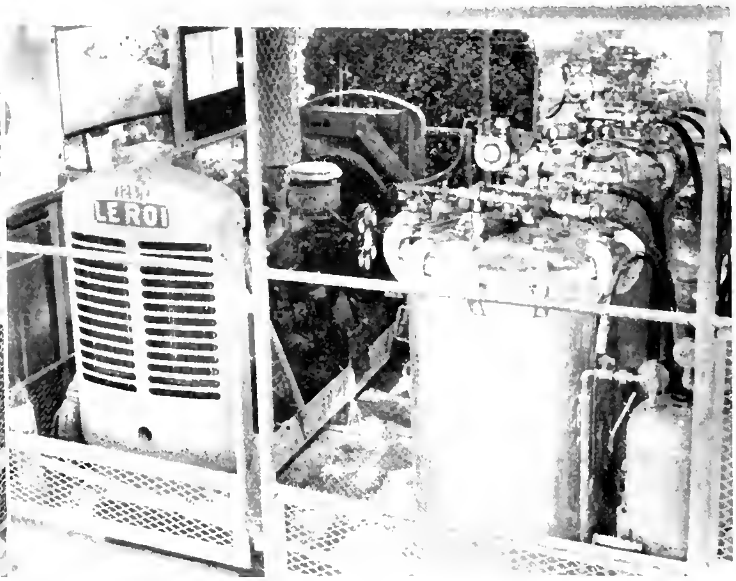
The modern highway marker, as designed and built by the Equipment Department, is capable of not only painting the stripes, but of precleaning the surface to be painted, placing the stripes, and applying reflector-type glass beads, all in one combined operation. It is capable of continuing this process for long periods with only necessary shut-downs for loading paint and rest periods for the skilled maintenance crews who operate it.

Composite Machine

The composite machine is made up of a three-ton cab-over-engine type truck chassis with a special flat-rack body, the truck pushing a marking

Modern traffic line marker with "mother" truck





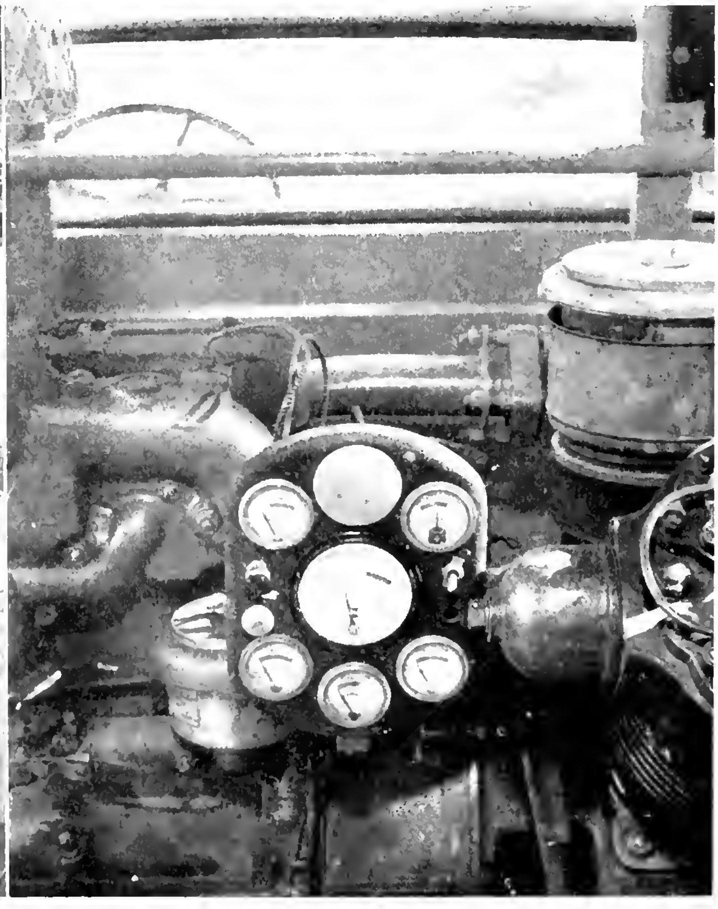
LEFT—Arrangement of paint tanks showing air driven mechanical agitators. RIGHT—Close up of compressor and paint tanks using air-driven mechanical agitator.

machine which is equipped with a motor-driven cleaning brush, paint gun, and bead dispensers.

The truck, which requires a long wheelbase and bed, carries an air compressor, air receiver, paint tanks equipped with either electric or air agitators, a solvent tank, and an engine-generator when equipped for electric-motor-driven paint agitators.

The cylindrical pressure tanks are mounted vertically, in such a manner that they may be readily and easily filled with paint by removing the top. They may be flushed and cleaned by

LEFT—Interior view of "mother" truck. RIGHT—Control panel on main compress of "mother" unit.



means of a drainage system through the bottom of the truck-bed. Paint solvent is carried in an auxiliary tank, under pressure, and piped so that all lines and equipment may be flushed clean at the end of the day's work.

Agitation of the paint is accomplished either by means of electric or air-driven agitator paddles. Either system gives satisfactory results.

Winter Operations

For winter operations, the traffic line paint is passed through a shop-designed hot water heater mounted on the front of the truck and obtaining its hot water supply from the truck radiator. The heater can be adjusted to bring the temperature of the paint to the desired level for application.

The truck is equipped with a large, vertically adjustable rear platform for the dual purpose of facilitating the loading of the paint and the placing of traffic-marker cones to protect the newly painted stripe during the drying period.

An automatic chute is now in process of being designed which will permit the placing of these traffic cones by a man standing in the bed of the truck.

A metal canopy is provided which covers the entire truck bed, and affords protection, from the weather, to the men and equipment.

The marking machine, which is pushed ahead of the truck, is designed for one-man operation. The controls are largely automatic and are located in the machine's cab, within easy reach of the operator. The marking machine, which is guided by the operator, is provided with a sight, or pointer, to assist in the accurate alignment of the stripe. This arrangement requires that the truck driver maintain his truck in an approximate position only, the accurate location of the stripe being under the control of the striping machine operator.

Most Effective Results

Stripe spacing, paint control, and bead placing, as well as the alignment, are under the control of the operator. The most effective results are obtained at an approximate five mile-per-hour speed.

Placing the stripes, with this equipment, consists of only three operations. First, the placing of signs, by a pilot vehicle, to warn oncoming traffic that the striping equipment is following; next, the actual striping operations, including the placing of protective marker cones; and the final step, the gathering up of the protective marker cones when they have accomplished their purpose. The three steps are carried on simultaneously.

The operation of this complicated striping equipment is under the supervision of the Maintenance Department of the Division of Highways. They have developed highly skilled crews, who operate these machines with efficiency and a minimum of delay. Like all machinery of a complicated nature, the successful operation depends upon the skill of the operators. The striping crews are deserving of credit for the results.

Equipment Design for Safety

Striping must, of necessity, be carried on under heavy traffic conditions, which involves some hazard to the men. While safety records for this operation are excellent, insofar as this State is concerned, the Equipment Department is continuing equipment design studies to improve the equipment from this standpoint.

It is possible that the marking machine, which is pushed ahead of the truck, may be eliminated by using a long wheelbase vehicle with a front-wheel drive. This would make possible the elimination of the drive-shaft and rear axle, which would permit the marking machine and the operator to be suspended near the rear of the truck and between independently mounted rear wheels, thus affording him protection from traffic and also combining the present two units into one.

Study is also being given to the feasibility of suspending the marking machine from the front end of the truck by cantilever support, and controlling it from the truck cab.

With the cooperation of the Maintenance Department and the benefit of their operating experience continued improvements will be added to the complicated equipment used in this important phase of traffic control.

NEW BUDGET

Continued from page 35 . . .

Stanislaus County—US 99, vicinity of Ceres and Modesto, $2,000,000.

The major construction projects in the budget affect nearly 300 miles of state highways and provide for 45 bridges over streams and 165 other structures, including highway separations and railroad separations. Approximately 135 miles of the proposed improvements involve full freeways, which when completed will bring California's total of full freeways to more than 500 miles. In addition, the 65 miles of proposed expressway and other multilane divided construction (with some intersections at grade) will increase the State's total of multilane divided highways of all types to nearly 1,900 miles, or some 13.5 percent of the 14,000-mile State Highway System.

Over-all Budget $348,704,600

The over-all budget total, including certain allocations for such nonstate highway purposes as city streets and county roads, is $348,704,600. Of this amount $37,983,000 is for nonstate highway expenditures, including $27,-660,000 to cities for city streets (⅝ cent per gallon of the gasoline tax); $6,530,000 in the federal aid secondary funds for county roads; $3,707,000 in state funds to counties to assist in the required marching of federal aid secondary funds; and $86,000 for outdoor advertising supervision.

Apart from the $247,338,000 for major construction purposes, other state highway items in the budget include: $25,000,000 for maintenance; $6,850,000 for administration; $4,507,-600 for contingencies; $18,026,000 for preliminary engineering; and $4,500,-000 for buildings and plants.

DRIVING NEAR PARKED CARS

When driving near parked cars, drive with care. Drive as far away from the line as conditions will permit. And look ahead. Practice the habit of anticipation. Be alert for any indication of movement among the cars, for any indication of erratic movement among the adults or children on the sidewalk.

Findings

The Effect of Clay on the Quality of Concrete Aggregates

By BAILEY TREMPER, Supervising Materials and Research Engineer, and W. E. HASKELL, Associate Materials and Research Engineer

CLAY * when it is present as a coating on the surfaces of the mineral particles that constitute concrete aggregate has long been regarded as deleterious. Evidence of this may be found in many specifications that require the aggregates to be "free from clay or other deleterious coatings" or by requirements that the aggregates shall be washed. The enforcement of restrictions against clay generally are in the form of a maximum limitation on the percentage passing No. 200 (or finer) sieve as determined by wet sieving (wash). But this test does not distinguish between clay and inert dust nor does it furnish a clue as to the degree of activity of the clay, if it is present. The inclusion of the No. 270 sieve in the sieve analysis, although a step in the right direction, has not resulted in the needed discrimination.

Wet Sieve Analysis

Because of the shortcomings of the wet sieve analysis, and the time required to complete it, personal judgment is often resorted to as a means of evaluating the cleanliness of the aggregate. Frequently such opinions cannot be justified by the results of wet sieve analysis. If the investigation is carried far enough to make concrete with the questionable aggregate and the same material after thorough scrubbing it is not unusual to find that the suspected clay has not reduced the strength significantly. Instances are on record of the use of a soil as an admixture to concrete with evident improvement in workability and without serious effect on the compressive strength, particularly if the mix was lean and harsh. On the other hand there is a great deal of evidence showing that excessive

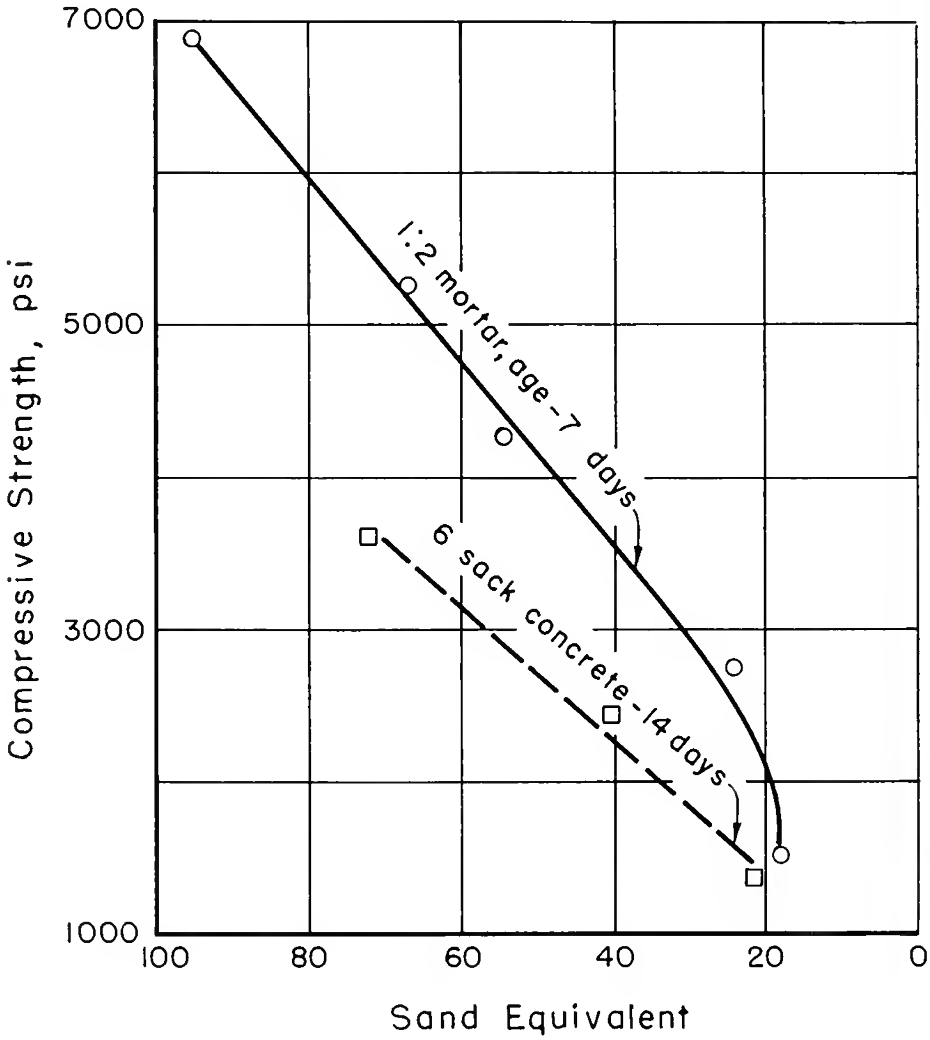


Figure 1

Relationship between sand equivalent and compressive strength

amounts of clay whether in the form of a coating or as discrete finely divided particles have resulted in serious reductions in strength. There is a lesser amount of evidence to show that the clay contributes to excessive volume change.

Sand Equivalent Test

These apparent anomalies may be explained by the deficiencies of human judgment and the fact that no test method has been available to yield an evaluation of either the quantity or the activity of the suspected clay. Clearly a test of another type is indicated. Tests of the desired type have been developed in the laboratory of the Materials and Research Department of the Division of Highways. These are known as the Sand Equivalent Test which is applied to sand

* The term "clay" is used in a broad sense and may not necessarily be restricted to the true clay minerals. It may include mixtures of colloidal particles with finely divided inert material such as silt. The term is intended to include only mixtures that contain colloidal particles and exhibit some degree of plasticity as distinguished from inert rock dust.

passing a No. 4 sieve and the sedimentation test which is applied to coarse aggregate.

The theory, background and development of the sand equivalent test has been described in the technical literature.* Aside from an interdepartmental report, nothing has been published concerning the functions of the sedimentation test. The exact methods for conducting the tests however have been described and they form a part of the Manual of California Test Procedures of the Materials and Research Department.

Details of Manipulation

Although differing in details of manipulation, because of particle size of the aggregates involved, both methods are based on the same principle. Clay if present in the sample either as a coating or in the form of discrete particles is brought into suspension in a dilute solution of calcium chloride which causes colloidal particles to coagulate. The suspension is allowed to settle for a definite period and the height of the suspension is measured. The units in which the results are expressed is different for the two tests. Higher values of sand equivalent indicate less clay while higher sedimentation values indicate more clay. The possible range in sand equivalent value is from 0 to 100 whereas the range in sedimentation values is from about 2 to 15.

Laboratory studies have been made to determine the effect of variations in sand equivalent and sedimentation values of fine and coarse aggregates on the quality of mortar and concrete made from them.

SAND EQUIVALENT

Sand from one pit was treated to yield five degrees of cleanliness ranging from the pit-run material having a sand equivalent of 18 to well-scrubbed product having a sand equivalent of 95. Tests of these sands when mixed into mortar and concrete showed that the compressive strength decreased sharply, and the linear shrinkage upon drying increased, as the sand equivalent became lower (i.e. more clay). The results of these tests are shown in *Figures 1 and 2.*

* F. N. Hveem, Sand-Equivalent Test for Control of Materials During Construction. Proceedings of the 32d Annual Meeting of the Highway Research Board.

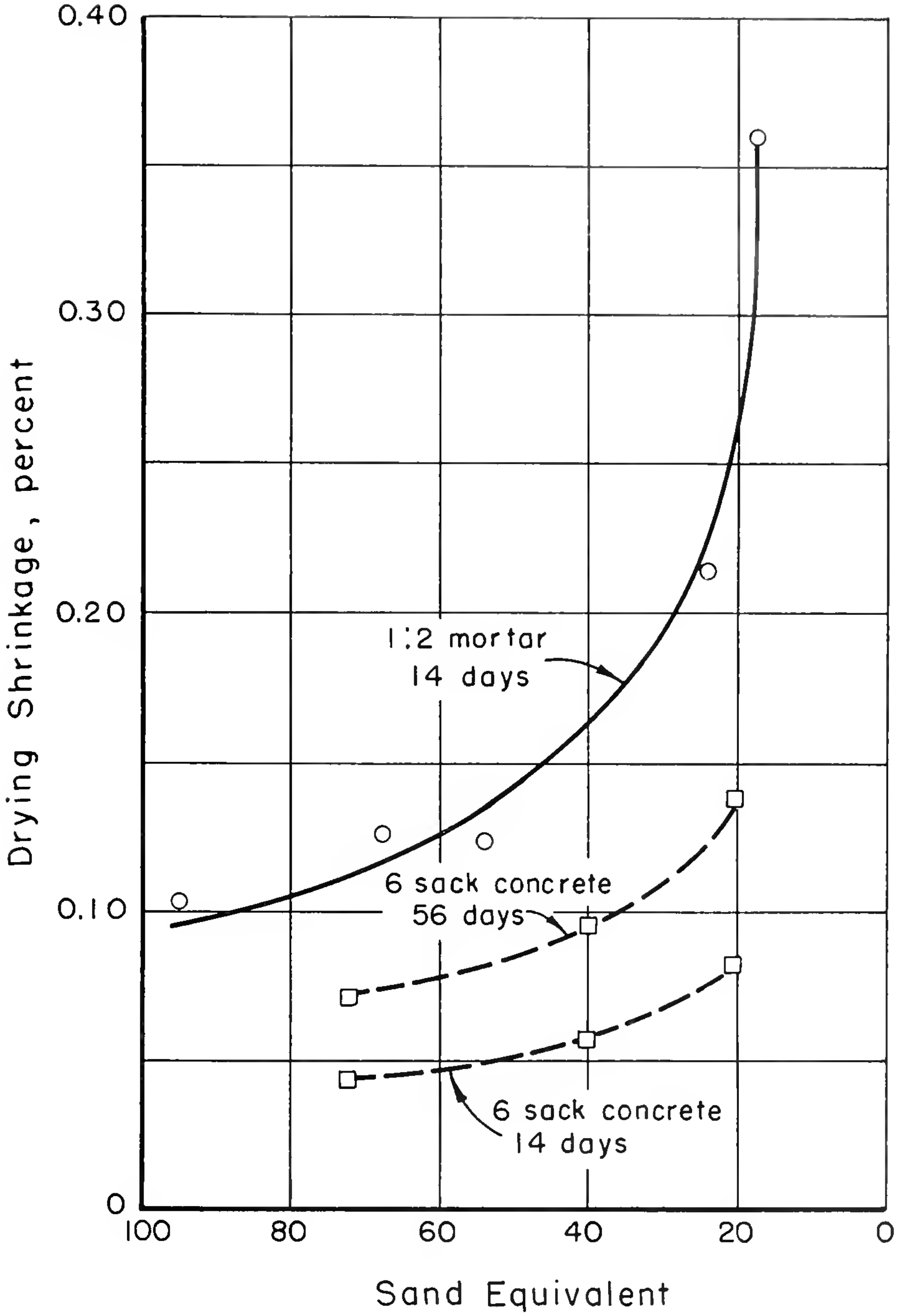


Figure 2

Relationship between sand equivalent and drying shrinkage

It is believed that volume change as exemplified by drying shrinkage is often a more important factor in the performance of concrete used in highways than is strength. Unfortunately volume change in the form of either shrinkage or expansion has received only a fraction of the attention in the design of concrete that has been devoted to strength. Unequal drying between top and bottom of pavement slabs is partly responsible for curling and the consequent reduction in support of the slab ends. Excessive shrinkage of concrete that is restrained by reinforcing steel, or by the friction of the subgrade under pavements, produces cracks that are entry points for agencies of deterioration. Unless volume change is known accurately during the design of prestressed members they may not function as intended.

Clearly it is essential to control volume change within reasonable limits.

More Infarmatian Obtained

In order to obtain more information on the range in drying shrinkage to be expected in practice, and to learn to what extent the sand equivalent may affect drying shrinkage, each sample of concrete sand that was received in the laboratory during a period of 15 months was tested for sand equivalent, absorption and drying shrinkage of mortar containing the sand. In all, 248 samples from 142 sources of supply were tested by these methods. *Figure 3* shows the results obtained in these tests. The sloping solid line shows the statistical relationship between the two variables. The equation shown in the diagram is the mathematical expression of the relationship. The broken lines represent the probable range in accuracy of the equation. Statistical analysis shows that the correlation is real and of a relatively high order.

Sampler Tested

Most of the sands tested were produced to meet specifications that did not include a sand equivalent requirement. The sand equivalent of many was in the range of 60 to 80 although a large number exceeded 80. In many cases two or more samples were received from the same source of supply in which event the results were averaged and are shown as solid dots in *Figure 3*. Open circles represent tests of single samples from a given source of supply. It will be noted that the majority of points that lie outside the broken lines represent tests of single samples. Had results of repeat samples been available it is probable that some of them would have conformed more closely to the general equation.

The equation as derived means that a sand having a sand equivalent of 60 produced twice the drying shrinkage that results from a sand equivalent of 92. Nearly all of the samples tested complied with the specification requirements that not more than 4 percent shall pass the No. 200 sieve. The establishment of a minimum value of sand equivalent in the specifications is thus seen to provide a means of improving the quality of concrete that was not available formerly. A minimum value of 80 was selected as the best compromise between the desire for highest quality and the ability of producers to meet the requirement without greatly increased expense.

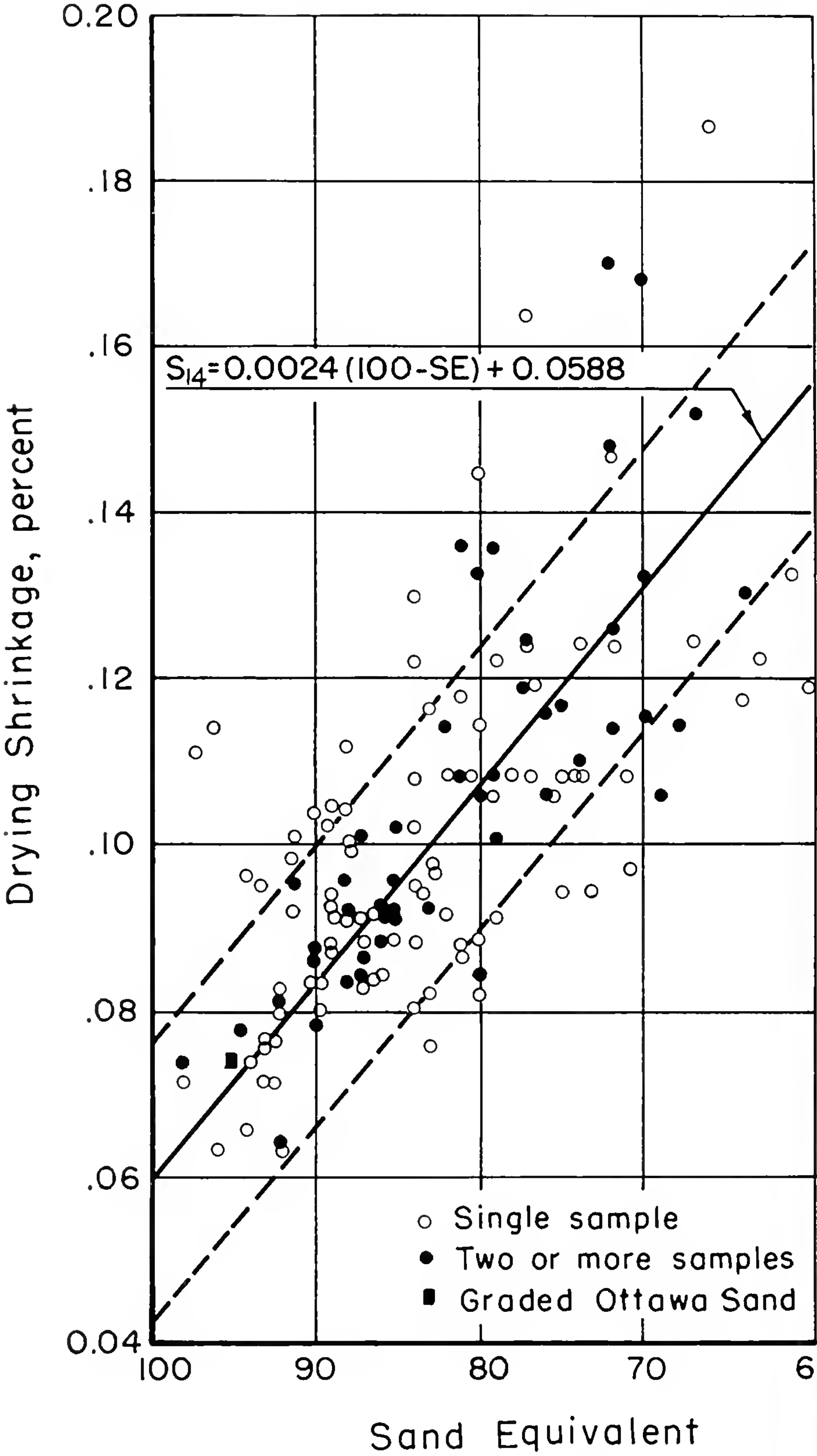


Figure 3

See Figure 3

With further reference to *Figure 3* it will be noted that a number of sands, tests of which were made on several samples, are represented by points that fall outside the broken lines. These points all represent sands produced in Northern California and, further, can be grouped into a few geographical areas. It is indicated therefore, that there is some factor other than sand equivalent that affects drying shrinkage. Other investigators have concluded that cement paste in attempting to shrink is restrained by the particles of aggregate and that the greater the rigidity of the aggregate the greater is the restraint to shrinkage. It was further concluded that the restraining effect of the aggregate was related to its porosity as measured by the absorption test. Such a conclusion is borne out by the results of the present tests. In *Figure 3*, the average absorption of the sands plotted above the upper broken line is 1.4 percentage points higher than the average for the sands which are plotted below the lower dashed line. The data strongly suggest that a correlation exists between absorption and drying shrinkage and statistical analysis shows this to be true. A computation of the multiple correlation between sand equivalent and absorption combined and drying shrinkage shows that it is exceptionally high. The adoption of limitations on both sand equivalent and absorption in the specifications would furnish nearly a perfect control on drying shrinkage insofar as it is affected by the character of the sand.

The sand equivalent of an aggregate can be improved by manufacturing processes but a reduction in absorption would be difficult, if not impractical, to accomplish. A stringent limitation on absorption would virtually eliminate some pits as potential sources of supply. The effect of such elimination would present a serious economic problem.

SEDIMENTATION VALUE

Studies of the sedimentation value of coarse aggregates to date have consisted of tests of eight ¾-inch x No. 4 gravels, which are considered to represent fairly the range of available commercial products and of three pit-run aggregates to determine the effects of high amounts of clay coating. In the preparation of these samples all loosely adhering fine material was removed by dry sieving and the test results reported herein measure the effect of clay as a coating. Test specimens were molded from concrete mixtures containing each of the coarse aggregates and a single lot of sand.

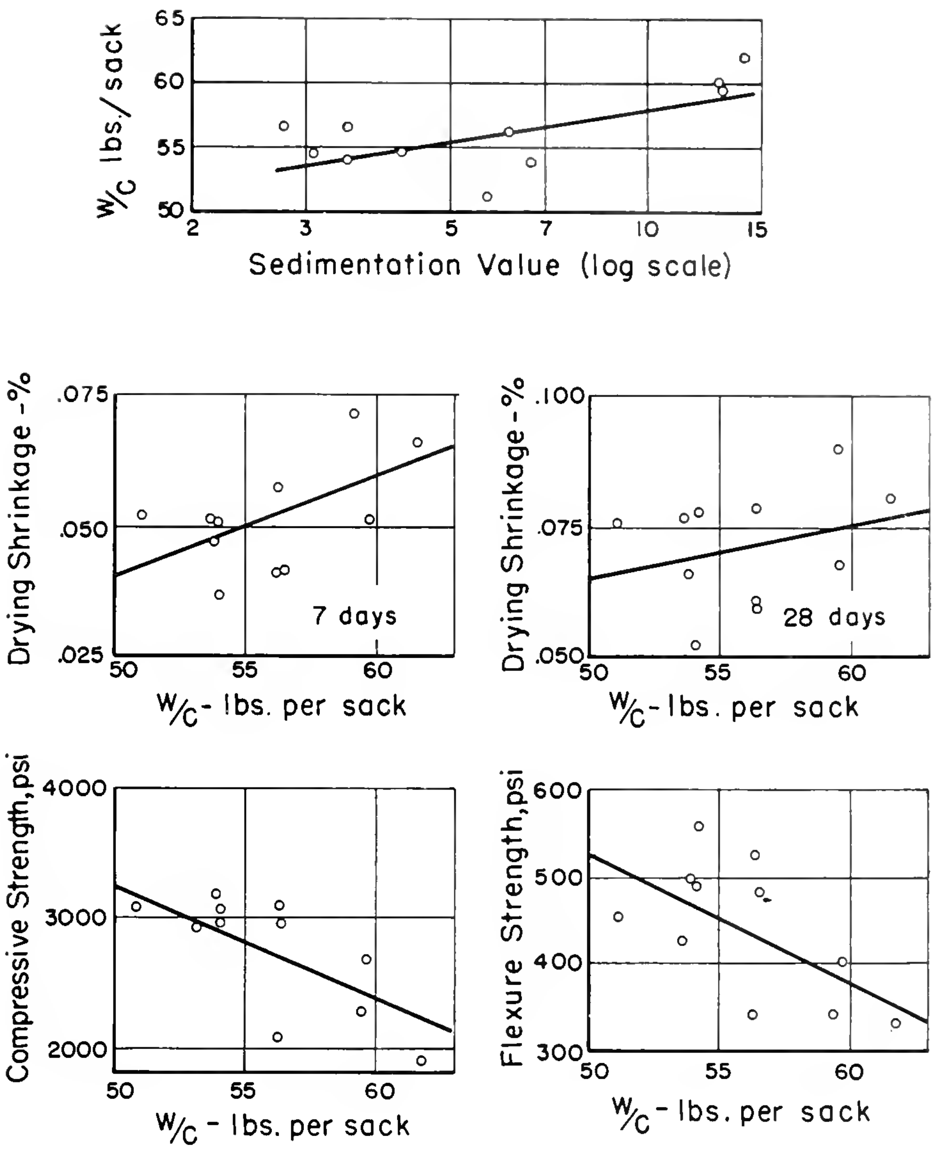


Figure 4

Relationship between water-cement ratio and drying shrinkage, compressive strength, and flexural strength

In these tests the amount of water required to mix the concrete to a common slump varied among the aggregates and tended to increase with increasing sedimentation value. The test data are shown diagrammatically in *Figure 4*. The coefficient of correlation while indicating real correlation is not particularly high. Relationships between sedimentation value and flexural strength, compressive strength and drying shrinkage are shown in *Figures 5 and 6*. Coefficients of correlation are relatively high and indicate that the sedimentation value has an effect on the quality of the resulting concrete that is not accounted for entirely by variations in water demand.

Equations Derived

Equations derived from the test data by statistical methods indicate the following:

. . . Continued on page 64

FACTORS IN OUTPUT OF HIGHWAY ORGANIZATIONS

By HARMER E. DAVIS, Director
Institute of Transportation and Traffic Engineering,
University of California, Berkeley

Over the past decade enlarged programs of highway construction initiated by the states, and stepped-up federal-aid appropriations have called for continually increased output from the state highway departments of plans, designs, specifications, and construction supervision relating to new construction, and of operational control of increasing lane-miles of existing facilities. All indications point toward the necessity of a further marked increase in output to meet the demands of highway transportation in the decade ahead.

Highway engineering agencies, the country over, have achieved a remarkable record of new and improved facilities put in place since 1945. They have done this by marshalling increased manpower and by a gradual development of time-saving techniques. But there now appears to exist a shortage of some 4,000 engineers in the state highway departments alone, according to a recent survey.[1] With a substantial further acceleration of highway construction programs on a nation-wide basis, which seems probable, a very critical manpower situation could develop. However, those who have looked into this rising problem agree that it will be possible to avoid an overly critical situation if appropriate counter measures, some already well-developed, are put into general effect.

INVENTORY OF ENGINEERING MANPOWER

It is my purpose here to analyze some of the aspects of this manpower and output problem, and to describe some of the developments that are taking place.

As a first approach to a consideration of the problem, it is helpful to make an inventory of the factors which bear upon the situation. These include an inventory of present manpower, and of the trends in production of new manpower.

EDITOR'S NOTE: This study of the engineering manpower problem was presented by Professor Davis at the annual meeting of the Western Association of State Highway Officials at Jackson Lake, Wyo.

Harmer E. Davis

In a survey made by the Highway Research Board in the fall of 1954 it was reported [1] that the number of engineers employed by the highway departments of the 48 states, the District of Columbia, Hawaii, and Puerto Rico was 18,034. About two-thirds of these departments also used the services of private consulting engineering firms to some extent, and it was reported that 4,192 additional engineers would have been needed if the consultants had not been employed. Combined, these are equivalent to 22,226 persons in engineering classifications engaged on the 1954 state highway programs. The report of the survey also indicated that the highway departments estimated they would have needed 3,990 additional engineers in order to work at maximum effectiveness.

In the response to the survey, the highway departments also estimated the number of engineers they would need for programs 50 and 100 percent larger than their 1954 programs. Granting that such inventories and estimates contain elements of uncertainty, nevertheless the order-of-magnitude of such figures are useful and significant in appraising the type of situation we are dealing with here. The estimates indicated that the minimum number of engineers needed for a 50 percent increase in the programs would be about 8,700, and for a 100 percent increase almost 14,000. It is presumed that these estimated needs are based on a projection of utilization of engineering personnel under current methods of office and field practice. But the significant factor that comes to mind immediately, as I shall show later, is that it is unlikely that engineers in any such numbers will become available for recruitment, at least for a considerable number of years to come.

Significant Finding

There was another highly significant finding brought out by a study of the results of the survey: there appear to be appreciable differences in the number of engineering personnel (excluding maintenance engineers) employed per dollar volume of construction. It was calculated that the ratio of engineers employed per million dollars of capital outlay ranged from 2.0 to 28.2, with a median value of 7.2. Now it is quite possible that, to some extent, differences in designation of personnel in engineering classification may account for this large variation; some preliminary results of a special study now going on in selected states with very high or low ratios indicate that this is the case. Another factor may be the characteristics of the construction program. There are some indications that work in urban areas, requiring more details of planning, design and control, may require more engineering personnel per dollar volume of construction. But this finding also leaves the thought that some states have developed different practices in the utilization of personnel in engineering classifications. Pursuing this point one step further, it was estimated in the study that, if the utilization of engineers per million dollars of capital outlay were held to a value not to exceed the median value found in the survey, for a 100 percent expanded program some 26,000 engineers would be required by all state departments instead of the indicated 35,000.

Distribution of Personnel

Another finding of the survey which is of interest is the distribution of personnel among the engineering functions. The average distribution for the state organizations is shown in the following tabulation:

Function	*Percent of engineering personnel*
Planning and traffic	6
Location	5
Road design	23
Bridge design	8
Construction	40
Materials and testing	7
Maintenance	6
Admin., contracts, R/W, etc.	5

This indicates that if time- and labor-saving procedures can be devised functions which might certainly be examined are those of the design office and of construction control.

In the 1954 study by the Highway Research Board, a sampling of cities, consulting firms, and toll road authorities was also made. This was not inclusive enough to enable a firm estimate of the total requirements for these agencies; also it did not include counties, townships, special highway districts, or the engineering personnel in other agencies of government performing highway engineering functions. Thus an over-all picture is lacking, although the survey does give a reasonable guide to requirements under current practices.

New Manpower Production

Some statistics concerning trends in civil engineering enrollments, prepared by Professor R. A. Moyer,[2] based on Engineers' Council for Professional Development data published by the American Society for Engineering Education, are reproduced in Tables 1, 2, and 3. Significant points to be drawn from these data are as follows:

TABLE 1. TOTAL COLLEGE ENROLLMENT AND THE ENGINEERING ENROLLMENT IN THE UNITED STATES IN 1940 AND 1947-1954

	College enrollment in the United States [a]		
Year	*Total college*	*Engineering*	*Percent engineering of total college*
1940	1,490,000	113,497	7.6
1947	2,333,000	244,390	10.5
1948	2,410,000	241,554	10.0
1949	2,456,000	198,266 [b]	8.0
1950	2,297,000	161,324 [b]	7.0
1951	2,116,000	147,694 [b]	7.0
1952	2,148,000	158,518 [b]	7.4
1953	2,251,000	171,832 [b]	7.6
1954	2,499,750	187,454 [b]	7.5

[a] Includes graduate and undergraduate enrollment.
[b] Includes only ECPD accredited institutions.

1. While engineering college enrollment in the immediate postwar years was 10 percent or better of the total college enrollment, the percentage of engineering enrollment has dropped back to something slightly over 7 percent, which is about what it was just prior to World War II. Engineering college enrollment (in Engineers' Council for Professional Developments accredited colleges) totaled about 187,454 in 1954 and is now increasing at about 8 percent per year.

2. While, prior to World War I, civil engineering attracted the largest number of engineering students of all the branches of engineering instruction, since 1935 the civil engineering undergraduate enrollments have been between 10 and 15 percent of the total undergraduate engineering enrollments. In 1954, the total number of civil engineering undergraduates in Engineers' Council for Professional Development accredited schools was 21,560, about 13 percent of the total undergraduate engineering enrollment.

3. While the civil engineering departments currently have only about one-eighth of the total undergraduate engineering enrollment, the number of first degrees granted (B.S. or equivalent) is something less than one-fifth of the total first engineering degrees granted. In 1954, some 3,597 civil engineers were graduated.

TABLE 2. ENROLLMENT OF CE, EE, ME AND THE TOTAL FOR ALL UNDERGRADUATE ENGINEERING STUDENTS AT ECPD ACCREDITED SCHOOLS IN UNITED STATES DURING THE FALL TERM FOR SELECTED YEARS, 1910-1954

Source: Journal of Engineering Education

	Enrollment of undergraduate engineering students in United States during fall term							
	CE		*EE*		*ME*		*Total all engineers*	
Year	*Number*	%	*Number*	%	*Number*	%	*Number*	%
1910	77,900	26	5,500	18	6,400	21	30,337	100
1920	8,800	17	9,300	18	11,900	23	51,908	100
1925	12,200	22	17,500	33	10,300	19	54,337	100
1930	13,813	19	18,500	25	15,000	20	73,386	100
1935	7,800	13	10,000	17	12,000	20	60,395	100
1940	11,152	10	15,500	14	28,600	26	110,618	100
1945	6,820	10	11,100	16	13,100	19	69,146	100
1947	29,609	13	52,292	22	53,459	23	234,484	100
1949	27,135	15	40,946	23	42,758	24	180,646	100
1951	19,744	15	24,564	19	27,134	21	128,367	100
1952	20,283	15	26,696	19	29,335	22	138,170	100
1953	20,882	14	30,916	21	31,390	21	150,426	100
1954	21,560	13	36,987	22	35,126	21	167,103	100

Total number of ECPD Schools, 150 in 1954.

The influence of the current upswing in college enrollments is just beginning to be felt in the senior years, but the effect of this on the number of civil engineering graduates is not likely to be felt for another year or so.

TABLE 3. ENROLLMENT OF CE UNDERGRADUATES AND OF ALL ENGINEERING UNDERGRADUATES AND THE NUMBER OF FIRST DEGREES GRANTED IN CIVIL ENGINEERING AND IN ALL BRANCHES OF ENGINEERING AT ECPD ACCREDITED SCHOOLS IN THE UNITED STATES FOR SELECTED YEARS, 1930-1954

	Undergraduate enrollment				*First degrees granted*			
	Civil engineers		*Total all engineers*		*Civil engineers*		*All engineers*	
Year	*Number*	%	*Number*	%	*Number*	%	*Number*	%
1930	13,813	19	73,386	100	1,977	24	8,303	100
1940	11,152	10	110,618	100	1,430	13	11,358	100
1947	29,609	13	234,484	100	2,692	14	18,592	100
1948	31,798	14	226,117	100	3,271	12	27,460	100
1949	27,135	15	180,646	100	6,119	15	41,793	100
1950	22,449	16	142,954	100	7,312	15	48,160	100
1951	19,744	15	128,367	100	6,473	17	37,904	100
1952	20,283	15	138,170	100	4,917	18	27,155	100
1953	20,882	14	150,426	100	4,070	19	21,642	100
1954	21,560	13	167,103	100	3,597	18	19,707	100

Shortage of Engineers

An important general observation that is voiced by a number of agencies concerned with this matter is that students are not being attracted to the sciences and engineering at the rate that might be expected from the increases in high school graduates now becoming available. Some observers attribute this to a relatively decreased emphasis on preparatory subjects in the high schools that are a basis for entering the sciences and engineering in the colleges. In addition, it appears that in the engineering schools the appreciable enrollment increases are occurring in subjects that have attracted large public attention, such as electronics.

A net conclusion from the examination of these statistics and trends is that we shall probably not produce from the engineering schools in the United States more than 4,000 to 5,000 civil engineering graduates per year for the next several years.

Most of the college-trained engineering personnel recruited by the highway agencies are drawn from the civil engineering schools. Only a fraction of the civil engineering graduates, however, go into highway work. The demands for graduates in other phases of civil engineering are extensive. No accurate statistical data are available, but as a rough guide, I might cite a study we recently made at the University of California on the placement of graduates of civil engineering, from the classes of 1949 through 1953. Here we found that 22 percent of these graduates were employed in highway engineering; this may be higher than the percentage in many other schools, however, since considerable impetus is given to this field in California, both by the recruitment activity of the Division of Highways, and by the attention given in the curriculum. With this figure as a guide, it may be reasonable to expect that the number of graduates of civil engineering who will enter highway engineering work throughout the United States will not exceed 1,000 per year during the next five years.

Information is not available to give a good over-all picture of the replacements in highway engineering personnel needed each year. Moyer[2] places an extremely conservative estimate of losses due to deaths, retirements, and transfers out of the field at 2 percent per year. This means a replacement requirement of about 400 per year under present state programs. If an accelerated program at double the present volume were undertaken, the replacements needed would almost equal the current production of new civil engineering graduates currently willing to enter the highway engineering field.

Implications of Manpower Inventory

Considering the number of new graduate civil engineers, and the demands from other segments of civil engineering activity (besides highway engineering), it must be concluded that the total pool of professional civil engineering manpower, current and potential, is severely limited. This has two important implications:

1. Merely to make shifts of personnel from one state agency to another or from public to private employ, or vice versa, would not appear to offer a satisfactory solution to the manpower problem. Rather, the real problem with respect to the available pool of manpower is to utilize it most effectively.
2. The greatest possibilities for increased output of the highway agencies appears to be in the development and use of:
   a. Job organization, so as to utilize nonengineering personnel.
   b. Development and application of time- and labor-saving devices, methods, and procedures.

POSSIBLE METHODS OF INCREASING OUTPUT

As an approach to the general problem of increasing the output of highway facilities, from the standpoint of the highway agencies, we might consider the range of possibilities, summarized below in outline form.

I. PERSONNEL FACTORS
  A. Recruitment:
    1. New graduates.
    2. Engineers from other industries.
  B. Reduction of turnover.
  C. Contract for engineering services.
  D. Improved utilization of existing professional personnel:
    1. Delegation of nonprofessional functions to technicians.
    2. Delegation of nonengineering work to individuals trained in other fields.

II. ORGANIZATIONAL FACTORS
  A. Cut down lead time through reorganization of administrative practices (such as external and internal checking, approvals and clearances).
  B. Cut down lead time through improved legal requirements.
  C. Cut down construction supervision time through changes in construction control practices (such as methods and requirements for kinds of pay items, record keeping, cost accounting).

III. TECHNIQUE FACTORS
  A. Streamlined office and field procedures.

B. Mechanized methods of performing operations:
   1. Technical computations.
   2. Accounting operations.
   3. Special techniques, such as:
      a. Airphoto reconnaissance of topoography, materials.
      b. Photogrammetric mapping for location.

Comments on aspects of some of these possibilities are given in the following paragraphs.

Recruitment and Reduction of Turnover

Because new engineering graduates may be in short supply, especially strong efforts at recruiting will probably be necessary to attract a share of new men into the highway organizations. Not only is it necessary to bring the possibilities of careers in highway engineering to students by many kinds of recruiting techniques, but also the keenness of competition from other fields is making necessary an examination of what the job has to offer the man. Young graduates are not motivated by salary alone; the challenge of the work and the opportunity for advancement appear also to be serious considerations for today's graduates. They will avoid jobs in which there are likely to be several years of subprofessional work; this places a premium on a recognizable engineer-in-training program and advancement to work carrying some professional challenge. Many young men are also inquiring not so much about the starting salary but about the potentials 5, 10, or more years from now. Recently, many highway agencies have been able to raise the entrance salaries, but relatively little has been accomplished in the higher grades. This reduction in salary range has no doubt been the reason why good men have been attracted elsewhere after two to four years in this field. Perhaps the next step should be to raise the salaries of the top administrators so that adjustments can be made all down the line.

Contracting for Engineering Services

The practices of highway agencies in their use of private engineering firms to perform selected engineering services vary widely. A report of a recent study on this subject is available.[3] The first consideration here is the most effective utilization of consulting services within the framework of the over-all operations, and the selection of contractual agreements to achieve this.

Improved Utilization of Existing Professional Personnel

There are two aspects to the matter of utilization of professional engineering personnel. One relates to the segregation of professional and nonprofessional tasks or functions, and the other relates to possibility of drawing on personnel trained in other disciplines or fields to perform professional functions now ofter performed by engineers.

Information assembled by the National Manpower Council[4] indicates that the ratio of supporting technicians to professionals is considerably lower in engineering than in other professions such as medicine. The valuable time of a physician is devoted to the actual use of medical skill and judgment; other functions are performed by nurses and laboratory technicians. Perhaps one of the difficulties we encounter in engineering is a lack of a clear distinction between the purely technical and the purely professional—and perhaps this is where some heavy thinking needs to be done. At any rate, the key to this situation on a practical basis may have to be a job analysis and job reclassification procedure. Already in some departments, jobs such as draftsmen, delineators, computers, etc., are well established. Perhaps what needs to be done is to make them more highly valued vocations, with reasonable rewards for long and productive service. At any rate, when jobs of this kind are disentangled from the engineering professional ladder, personnel can be recruited from high schools or elsewhere, and trained through short-term, specialized courses. This kind of procedure offers great opportunities for increasing the output of a limited supply of experienced professional personnel. It was utilized very effectively early in World War II, in turning out a vast fleet of aircraft.

The use of professional people trained in disciplines other than engineering is proving advantageous to a number of highway departments. Statisticians, economists, accountants, and business administration graduates can perform certain functions just as readily as can engineers. Some of the functions such as right-of-way acquisition, traffic analysis and forecasting, and budgetary analysis and forecasting are areas that may be worthy of study in this respect.

Organizational Factors

Because there are usually no clear guides or direct means of evaluation, the way an organization does business is generally developed by trial-and-error methods, and continued by inertia. The staff resists even slight modifications because of the collective pain caused by such changes.

Organizational changes conceived by outsiders, however well-intentioned in the interests of efficiency, often have unforseen side effects. A smoother change can frequently be developed by the man on the job, but he often lacks the opportunity to make the change and live with it.

Here is an area that may be worthy of your critical examination. I am sure that many of you can think of changes in the legal and/or administrative procedures which would reduce lead time and the human time consumed in getting out projects. Urgencies and crises will provide the opportunities for organizational changes, and that agency is fortunate which has carefully analyzed what changes are desirable and takes advantage of a crisis to put them into effect.

Streamlined Office and Field Procedures

Dozens of ideas have been emerging in recent years about ways of reducing time and technical labor through improved office and field procedures. Standardization of certain features of plans and specifications is a possibility. Decrease in data required on plans is another; I recently heard of an engineering department where one design division was using 50 percent more time than another for plans because greater detail was presented, yet it was found that the facilities constructed were similar and the results produced were equal. The development of tabular data instead of making computations, or of simplified methods of record keeping, are other examples.

Mechanized Methods of Performing Operations

New methods of using machines for many formerly laborious computational processes are developing rapidly. For example, the California Division of Highways recently reported [5] a method of handling traverse computations on its IBM machines. Likewise, special processes, or adaptations thereof, such as photogrammetric survey methods on location, are developing. These entirely bypass some of the older procedures. A growing number of reports is becoming available on the use of mechanized field and office operations.

CURRENT DEVELOPMENTS

A realization of the importance of the manpower and output problem has led to a number of activities, now going on, which can be of aid to the highway departments. The Highway Research Board study of last fall is being supplemented by a detailed technical-personnel study in six states. In addition, the board has been getting information from the states on their time- and labor-saving possibilities, with a view to pooling the information and making it available. Preliminary results [6] are apparently showing a wealth of information, which will be summarized and issued as rapidly as possible. The developments include the following:

14 States report using personnel from other disciplines with time savings for the engineering staff.
34 States report having realigned functions of divisions with increased efficiency.
35 States report the use of mechanized procedures basic to compiling road inventory and related data.
12 States report having mechanized procedures for traffic assignment computations.
16 States report having evolved rule-of-thumb methods for quick evaluation of alternate routes.
10 States report having developed high-speed computer methods for determining yardage for earthwork or for drainage structures.
34 States report having replaced bridge computations by use of tabular data.
4 States report having developed new methods in final cross-sectioning.
19 States report having modified specifications to simplify methods of measuring items.
20 States report having developed short cuts in routine materials testing.
16 States report having developed short cuts in traffic field studies.

To supplement the research on time- and labor-saving methods and to fill in the gaps in knowledge which will permit a general appraisal of the manpower problem, a committee of the Highway Division of the American Society of Civil Engineers, under the chairmanship of Carl Fritts, and supported by the Automotive Safety Foundation of Washington, D. C., has been working in recent months and should be able to give some detailed information later.

The use of high speed computers has found important application in many fields of industry. A special study to determine the use and applicability of several schemes of such computational methods is being made in the U. S. Bureau of Public Roads.

SUMMARY COMMENT

The increasing tempo of highway development, and the prospects of still further increase in the years ahead, highlights the problem of manpower required to perform highway engineering functions. It is unlikely that the demands can be fully met by recruitment of additional, experienced, professional highway engineers or by new engineering graduates, whose numbers will remain inadequate for at least the next few years. This situation, in turn, highlights the need for increasing the output of highway engineering organizations by attention to better utilization of the existing pool of engineering manpower and by the use of time and professional labor-saving devices, procedures, and techniques.

No single course of action, no one personnel or methodological change is likely to solve our manpower problems. But many procedures are being developed, and we can be confident that they will include the basis for the handling of increased highway programs.

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[2] Moyer, R. A., "Trends in the Numbers of Students Enrolled and Graduating in Civil Engineering, as a Factor in Providing the Additional Engineering Manpower Required in an Accelerated Highway Program in the United States," in *Engineering Manpower in an Accelerated Highway Program, Special Report*, I. T. T. E., University of California, Berkeley, California. March, 1955.

[3] Berry, D. S., et al., *The Use of Private Engineering Services by State Highway Departments*, Research Report No. 21, I. T. T. E., University of California, Berkeley, California. June, 1955. See also Highway Research Board Bulletin No. 106, p. 25.

[4] National Manpower Council, Proceedings of a Conference on the *Utilization of Scientific and Professional Manpower*, Columbia University Press, New York, N. Y., 1954.

[5] Osofsky, S., and Breece, R. K., "Automation—Machine Computations Save Engineering Time," *California Highways and Public Works*, July-August, 1955.

[6] "Time Savings in Highway Engineering," (Progress Report) Highway Research Correlation Service *Circular 286*. Highway Research Board, National Research Council, Washington, D. C., July, 1955.

HIGHWAY ENGINEER TRAINEE EXAMINATIONS ARE CALLED

The United States Civil Service Commission has announced an examination for Highway Engineer Trainee positions paying $3,415 and $4,345 a year, in the Bureau of Public Roads located throughout the United States.

To qualify, applicants must have completed their third or fourth year of a professional engineering curriculum in civil engineering (or expect to complete such study by September 30, 1956), or they must have had at least four years of progressive experience in civil engineering. A written test will be given.

Further information and application forms may be obtained at many post offices throughout the country, or from the U. S. Civil Service Commission, Washington 25, D. C. Applications must be filed with the Board of U. S. Civil Service Examiners, Bureau of Public Roads, Department of Commerce, Washington 25, D. C. They must be received, or postmarked, not later than January 24, 1956.

DOOR TO MEXICO

More automobiles enter Mexico from the United States by way of Laredo, Texas, than any other point of entry. Some 30,000 cars entered through Laredo during the first seven months of 1955.

ENGINEER'S WIFE WRITES ABOUT JUNGLE ROAD BUILDING

The many friends of Donald (Bud) Hall in the Division of Highways and the highway contracting industry in the West may be interested in the accompanying letter to "California Highways and Public Works" from his wife, Maxine. Hall is locating a road through jungle country for the Bolivian Government. — Editor.

We have been here in Cochabamba four months—time has gone by on wings. We love it here. Cochabamba is an enchanting city with its red tiled roofs, pink churches, and blue skies. The city cuddles against a grand range of mountains, one of which, El Nevado, is snow-garbed all year. One hears the chiming of bells all day long as we have many venerable old churches. Our climate comes straight from Heaven.

We have had some wonderful trips, by automobile, throughout this country—the traveling is far different than in the States. Here one really pioneers the road. We took a safri (I call it that) into the Pondi Jungle, which was thrilling. We left in a pick-up truck with a power wagon following carrying fuel, spare parts, and two extra drivers—one never travels here with less than two cars. We were making a trek to the Yacapani River—Bud had to scout a road job which the Bolivian government wants built. We made our own trail, hacking our way along. Since bridges are unheard of here and Bolivia is threaded with rivers we spent a great deal of our time being towed through water. The jungle was wonderful: strange birds, and hundreds of bright yellow chattering monkeys. We were met by suspicious Indians peeking out of the foliage, all carrying knives and bow and arrows. They were apparently as afraid of us as we were of them; even so we did not try to overstay our welcome, getting out of there in short time.

This week Bud took Mary and me with him into the Caroni and ChaCha Jungle country. The company is building a road into this area for the purpose of constructing a power plant and dam to supply more electrical power to Bolivia. We really saw rural life here and many of the small villages—poor, poor people. We left here at 8 in the morning and started ascending, a steady climb for four hours; just one long looping, winding trail up the mountain—on one side the mountain and on the other a tremendous gorge; thousands of feet below a small speck of a river flowing along. Such vistas, such magnificent country, make one feel so insignificant. On many of the switchbacks the front end of our car appeared to be suspended into space; I closed my eyes and prayed for everyone. At one point we walked down the side of a mountain to see a falls which rushes and tumbles down a sheer rock cliff for 2,000 feet—the noise alone is frightening. I had considerable trouble making the climb back up the mountain, was panting like a tired old dog. The young man with us was trying to help me and kept saying "breathe slowly and through your nose or else you will catch a terrible cold."

"Look, I don't care how in the heck I breathe, just give me some air or else some wings for my feet!" I finally said. We were at an altitude of 11,400 feet—the air is very thin and cold, just not any oxygen. Well, I saw the falls. After some hours of touring we started down into the jungle, sudden change of scenery from the bleak Andean Mountains into this rich green growth. We had our picnic lunch in a mahogany grove—sandwiches, pickles, cake, and tea with cognac—such fun. On our return trip we stopped at the company camp, which is perched out on a rock ledge overlooking a river and fertile green valley, bleak and windswept spot. Here we were served black, syrupy Bolivian coffee. The first sip guarantees to roll the head right off your shoulders. Our return trip was a fast one as it was all down hill.

So many amusing things happen here. Bud noticed the other morning that his driver, George, was wearing glasses for the first time, so he asked him about them. George said: "Since the Senor Hall wears glasses I thought I would wear them and look more important."

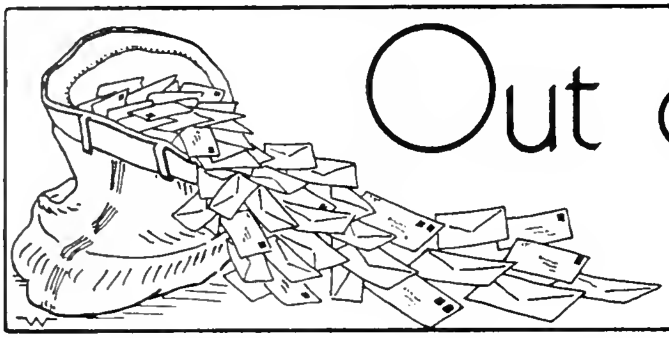
Bud said: "I hope he can see out of them and not be driving us over a cliff." These people are very child-like in many ways.

We have two wonderful girls working for us—my cook is only 17 years old but what a fine responsible child. I was forced into a situation about two weeks ago, where I had to call Emma and ask her if she could have dinner for 10 people instead of the usual three—to be ready to serve within two hours. I returned to the house a half-hour ahead of our "unplanned" company, to find the table set beautifully with a lovely flower arrangement, everything under control in the kitchen. We served 14 people without any confusion all because of Emma. I might add it was delicious food, even to hot rolls and a pie made all in that short time. The Indians working for one are very anxious to show-off, so will kill themselves doing everything perfectly. I shall be one spoiled "witch" when we return to the States—all we do is dress ourselves.

Last Sunday we were guests at a Bolivian luncheon party, starting at 12.30 and lasting until 5. We ate and drank until I thought I'd collapse. After the lunch we were invited over to some friends for dinner and cards. Bud and I left around midnight, headed for bed, but some of our friends decided the Halls was a fine place in which to "party it up." We finally fell into bed at 4.30 Monday morning. We have had a phonograph-radio console loaned to us with a wonderful collection of recordings. Our guests were showing us all the Bolivian folk dances, lovely but very active. It was fun.

Mary (the Hall's daughter) is with us, which is wonderful for me as Bud is away a great deal of the time. She arrived on the plane wearing four full petticoats, which were too big to pack,

. . . *Continued on page 64*



Out of the Mail Bag

FINE SERVICE

BERKELEY 4, CALIFORNIA

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: About two years ago I asked you to send *California Highways and Public Works* to our son, Harry L. Pottol, who was then in Korea. You will be pleased to hear his reaction to the fine service you gave.

When he returned from Korea, we took him around to see the various freeway developments, and he told us he knew about these things; he had seen them in your magazine, and it was "a great comfort" to have it come to him so far from home.

Sincerely yours,

LAURA LEE POTTOL
(Mrs. Charles A. Pottol)

AVID READER

MYRON S. WALL
San Francisco 4

K. C. ADAMS, *Editor*

DEAR MR. ADAMS: I would not be without *California Highways and Public Works*. Every copy I have goes to my son who was raised in California and now lives in New York.

Faithfully yours,

M. S. WALL

GLAD YOU LIKE IT

California Highways and Public Works

DEAR SIR: My husband and I deeply appreciate receiving *California Highways and Public Works*. May we congratulate you for an interesting, well-edited, and informative magazine.

Sincerely yours,

WILMA B. ANDERSON
(Mrs. Jack C. Anderson)

SOURCE OF INFORMATION

MR. K. C. ADAMS, *Editor*

DEAR MR. ADAMS: As we are sure you will appreciate, *California Highways and Public Works* is a most valuable source of information and reference to this department, in particular.

We believe that without question, it is the finest magazine of its type to be published anywhere.

Yours very sincerely,

CALIFORNIA STATE AUTOMOBILE ASSOCIATION
C. H. A. DUKE, Manager
Touring Bureau

ANOTHER LETTER OF THANKS

ANGWIN, CALIFORNIA

California Highways and Public Works

GENTLEMEN: *California Highways and Public Works* is a really fine publication, and one of which we Californians can be proud.

We get great pleasure from its pages and considerable information, and we thank you for all our past issues.

Very sincerely,

NOAH E. PAULIN

PROUD OF HIGHWAYS

PASADENA

K. C. ADAMS, *Editor*

DEAR SIR: The magazine is enjoyed very much by our family. While we are not engineering people we do a lot of traveling in the State. We are proud to show our eastern friends our wonderful roads.

Very truly yours,

W. K. JARFFO

ARTICLES INTERESTING

ARCADIA

MR. K. C. ADAMS, *Editor*

SIR: It has been a real pleasure to receive your fine magazine for the past two years. From the pages of this publication a greater appreciation of California highways has been gained. I am certain, I know, that it has led to my investigating more of California's highways as well as using the primary routes of travel more to advantage. The articles on construction of freeways, costs and award of contracts are very interesting to me as I am engaged in construction work.

After I have read your magazine I send it on to England where it goes to some friends and thence to the local road council in Bucks County.

I look forward to your magazine every two months with relish and hope to receive it for many years. Best wishes.

Sincerely yours,

JAMES E. COGSWELL

KEEPS POSTED

LOS ANGELES

K. C. ADAMS, *Editor*

DEAR SIR: Again may I express my extreme gratification for having the magazine. It keeps me posted on my state highway situation as well as in my work with design of freeways for the City of Los Angeles.

I can think of nothing that should be added to or taken away from the publication.

Thanking you again.

DON E. FISHER
Street and Freeway
Design Division

THANKS FROM YREKA

CHAMBER OF COMMERCE OF YREKA

MR. K. C. ADAMS, *Editor*

DEAR MR. ADAMS: I would at this time like to express our appreciation for your fine work in the magazine. Up here where distances are greater between towns, highways are of prime importance. Your published study on Camarillo is one that will be saved for future reference as the time will come when some of the towns in this area will be bypassed.

Thanks again.

Sincerely yours,

HARRY CREBBIN
Secretary-Manager

FROM AN EDITOR

DEAR BROTHER EDITOR:

I appreciate your *California Highways and Public Works* very highly. When I finish reading them I pass them on to others.

I regard the publication as a signal public service. It gives information freely on where our money is spent and we can look the work over and form our own opinion as the benefits show up.

EDWIN F. JACKSON
Editor and Business Manager
Engineers Hall News

ENJOYS STATE HIGHWAYS

BERKELEY

California Highways and Public Works
Sacramento, California

GENTLEMEN: Have been reading the *California Highways and Public Works* publication for the past few years with interest and have enjoyed keeping abreast of the development throughout the State. I have been traveling throughout the State rather regularly and certainly do enjoy our fine highway system and its development.

It therefore gives me pleasure to express my appreciation for the fine work your body is doing and for the privilege of reading your publication from time to time as it reaches my home.

Very truly,

H. H. GLESSNER

AN ENGINEER WRITES

MANHATTAN BEACH

California Highways and Public Works

GENTLEMEN: I find your magazine to be not only very interesting but also very instructive. I have always been greatly interested in this publication as roads or highways have occupied my attention for a long time. I was a draftsman and then a chief of party with the former Los Angeles County Highway Commission from November, 1909, to the latter part of January, 1911. Arthur Loder was chief engineer and S. V. Cortelyou was office engineer.

Sincerely,

E. L. YOUNG

MAGAZINE HELPFUL

California Highways and Public Works

GENTLEMEN: We have found your magazine very helpful in our work, and think it is most informative and beautifully prepared. Thanks very cordially.

Yours very truly,

TOFFELMIER & TORBUTT
REALTY CO.
By H. E. TORBUTT

LIKES MAGAZINE

LAGUNA BEACH

MR. K. C. ADAMS

DEAR SIR: *California Highways and Public Works* is the most interesting magazine I receive, and we subscribe to several.

The last edition was very fine (as are all of them), as it dealt with our Santa Ana Freeway "close to home."

Want you to know how much I appreciate your sending me the publication.

Sincerely yours,

WILL HOPE

THAT'S A LOT

America's 58,000,000 cars, trucks and busses consume an average of more than 120,000,000 gallons of gasoline each day, reports the California State Automobile Association.

REMINISCING

ATASCADERO, CALIFORNIA

MR. KENNETH C. ADAMS, *Editor*

DEAR SIR: One of my neighbors loaned me a couple of copies of your wonderful magazine.

I have read every article in both of them and think they are very fine. The one about the new double bridge across Carquinez Strait was very interesting to me. At the time the first bridge was opened in 1926 I drove the first bus load of passengers over on the eastern trip to Salt Lake for the old Yelloway Stages.

I am an old freight and bus driver—having started to drive in California in 1917 over all the old grades—San Juan, Cuesta, Grapevine, Donner Summit, Peach Tree, Santa Cruz and Lakeport, to name a few. I can appreciate what this State has done for the motorist in the way of modern grades and freeways.

At 74 I am still driving and as I live on US 101, I drive a few miles on that highway every day. It is a lot different than when I drove over this same highway for the old Pickwick Stages as it was a two-lane, 18-foot road then.

At times I get to reminiscing over the old means of San Francisco bay transportation; the old Broadway ferry to Oakland and ferry to Sausalito and across from Point Richmond; the old drag over San Juan Grade, full truck and two trailers in low gear all the way and no brakes on either trailer. Do the drivers of today with modern equipment and freeways and easy grades really appreciate what California has done for the motoring public?

This is my thank you to the Division of Highways and the Department of Public Works.

Very respectfully,

FRANK H. GRIFFIN

THE DANGEROUS FEW

There's a small minority of drivers who don't seem to be able to drive according to common sense rules. They zoom in and out of traffic, taking chances right and left. The only protection against them is to be constantly alert and give them a wide berth.

FINDINGS

Continued from page 55 . . .

1. Aggregates processed to have a sedimentation value of 3 produced concrete having 18 percent greater flexural strength, 14 percent greater compressive strength and 19 percent lower drying shrinkage than did those processed to a sedimentation value of 6.

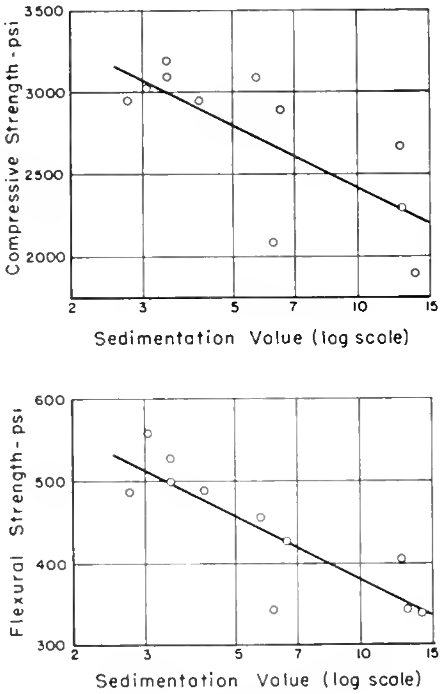


Figure 5

greater than 5. This maximum value was selected as a practical compromise between the desire for highest quality and the problems of manufacturing.

SUMMARY

The sand equivalent test and the sedimentation test furnish indexes of the quantity and activity of clay in aggregates that could not be obtained by other test procedures. These tests appear to be the only rapid ones presently available

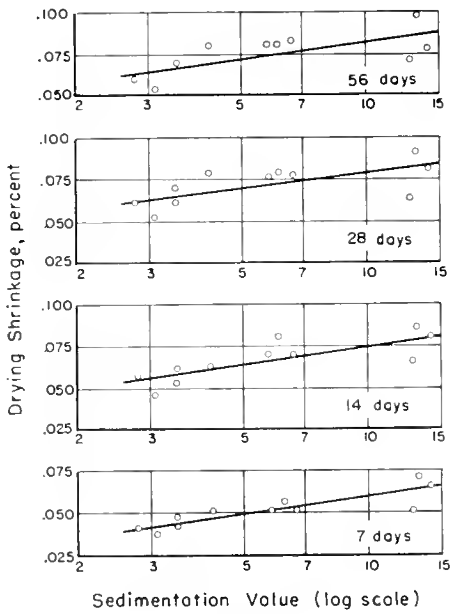


Figure 6

LEFT—Relationship between sedimentation value and strength. RIGHT—Relationship between sedimentation value and drying shrinkage.

2. If a pit-run aggregate having a sedimentation value of 12 is washed to a sedimentation value of 6 the improvement in quality is only one-half of that potentially available by processing to a sedimentation value of 3.

The Standard Specifications of the Division of Highways require that the sedimentation value of coarse aggregate for concrete shall not be

that can be used to insure that aggregates are really "clean."

Extensive test data show the inclusion in the specifications of a minimum sand equivalent of 80 for fine aggregate and a maximum sedimentation value of 5 for coarse aggregate for portland cement concrete, while requiring more thorough processing than formerly, results in an improvement that is real in its effects on strength and more importantly on volume change of the resulting concrete.

TWO-WAY RESPONSIBILITY

Driving an automobile is a two-way responsibility, says the California State Automobile Association. You must be responsible for your own driving as well as that of the others. Obviously you can't watch *all* the motor vehicles in traffic, but you owe it to yourself and your passengers to be constantly alert for dangerous drivers.

NEW CAVE ROCK TUNNEL

Construction is due to start early in 1956 on the boring of a second tunnel through Cave Rock at Lake Tahoe, on U. S. Highway 50 in Douglas County. Estimated cost of the project, which will include a roadside park, is $885,-000, to be provided by the Federal Government through forest highway funds.

JUNGLE ROAD BUILDING

Continued from page 61 . . .

and carrying a flour sifter. I had written and told her to bring a sifter as one cannot find any here. She flew from the East Coast having spent a month with Joan at Cape Cod. When she arrived a large group of people was at the airport to meet her. This is a custom here. She received lovely bouquets of flowers and champagne. She likes it here as well as we do; has met some very nice young people.

CRACK DOWN ON TRAFFIC OFFENDERS IN SAUDI ARABIA

When they crack down on traffic offenders over in Saudi Arabia, they really crack down.

Just a few months back the government there issued another decree to keep the wayward motorist in line. According to this decree, if an accident occurs as a result of speeding and negligence, but no one is killed in the accident, the offending driver is imprisoned for one year and has his license taken away. If anyone is killed in the accident, the offending driver has to be summarily executed.

Since the passing of this decree, points out the National Automobile Club, drivers in Saudi Arabia have been conspicuously sober and sedate. Some of them have even put the car away in the garage and hung the key up on a high place by the door.

THANK YOU

Los Angeles

Dear Mr. Adams: We continue to appreciate your wonderful publication more and more as the years go by. The September-October number just came today and is so very good. That cover is grand enough to frame.

We also appreciate the splendid freeway pictures you have featured recently, and for several years for that matter, inasmuch as we live right on Pasadena Freeway and have been constant users since January, 1940.

We have been a research and planning engineer for nearly 40 years and so appreciate these modern highway perhaps a little more than some citizens do. Frank W. Scott

GOODWIN J. KNIGHT
Governor of California

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J. W. VICKREY . . . Deputy State Highway Engineer
CHAS. E. WAITE . . Deputy State Highway Engineer
EARL WITHYCOMBE . Assistant State Highway Engineer
F. W. PANHORST . . Assistant State Highway Engineer
J. C. WOMACK . . Assistant State Highway Engineer
R. H. WILSON . . Assistant State Highway Engineer
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